

SELECTED
READINGS
IN
PATHOLOGY

From Hippocrates to Virchow

Edited by ESMOND R. LONG

PROFESSOR OF PATHOLOGY, UNIVERSITY OF CHICAGO



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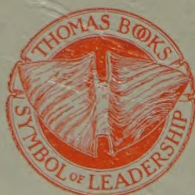
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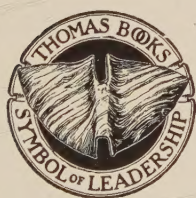


GIOVANNI BATTISTA MORGAGNI (1682-1771)

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CHARLES C THOMAS
SPRINGFIELD, ILLINOIS BALTIMORE, MARYLAND

MDCCCCXXIX

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SELECTED
READINGS IN PATHOLOGY

PREFACE

IN THIS volume are compiled a series of excerpts from the classics of pathology. They are republished in the wish to lay before physicians and medical students a short set of original documents in the evolution of this basic discipline of medical science, within the chronologic limits designated. In the teaching of pathology the works from which they are taken are often quoted, but from inaccessibility rarely read. A convenient collection in English therefore seems justified, although space restrictions necessarily render such a compilation fragmentary.

Most students of medicine form some idea of the great developments in our knowledge of the nature of disease between the "humoral" and the "cellular" pathology, but usually at second hand. They become familiar, for example, with the *rubor*, *tumor*, *calor* and *dolor* of the ancients, without, however, coming into contact with the ancients' own usage. They learn the origin of the word "syphilis", but have no opportunity to read Fracastoro's poem. The terms "Hunterian chancre", "Bright's disease", "Hodgkin's disease" and "Addison's disease" vaguely call to mind pronouncements first made a century or so ago, but students seldom have occasion to note what the physicians named said themselves of the lesions now so entitled. The story of Rokitansky's Quixotic revival of the humoral pathology is frequently told, but not often in the Viennese pathologist's own words.

It is to supply this want that the following compilation is put forth. It is not intended to present a connected view of the development of the science, which can be obtained from other, more comprehensive sources. The aim of this book is simply to furnish, in a frankly discontinuous way, a more intimate acquaintance with a few of the greater masters of the subject by allowing them to tell their own stories. Some of the extracts are of special historical significance, marking milestones in our progress in the knowledge of disease. The rest, while without this individual importance, are representative samples of certain lengthy volumes, which in their entirety were of unusual influence.

The chronologic order has been followed in assembling the collection. This has the disadvantage of breaking up the correlated

PREFACE

(Continued)

output of certain schools, but takes into account the fact that in former times, as now, prompt utilization in other lands followed the publication of new ideas in the one.

I am indebted, as on previous occasions, to the staff of the John Crerar Library for their courtesy in the loan of certain rare volumes. My thanks are due to Professor William Snow Miller of the University of Wisconsin and to Lt. Col. Fielding H. Garrison of the Army Medical Library for their aid with certain books not obtainable in Chicago. I have benefited greatly from the kind coöperation of my friend Mr. William H. Wilder, Jr., in the translations, and am much indebted to Miss Mabel Seibert for faithful work in accurate transcription.

E. R. L.

The University of Chicago.

May 1, 1929.

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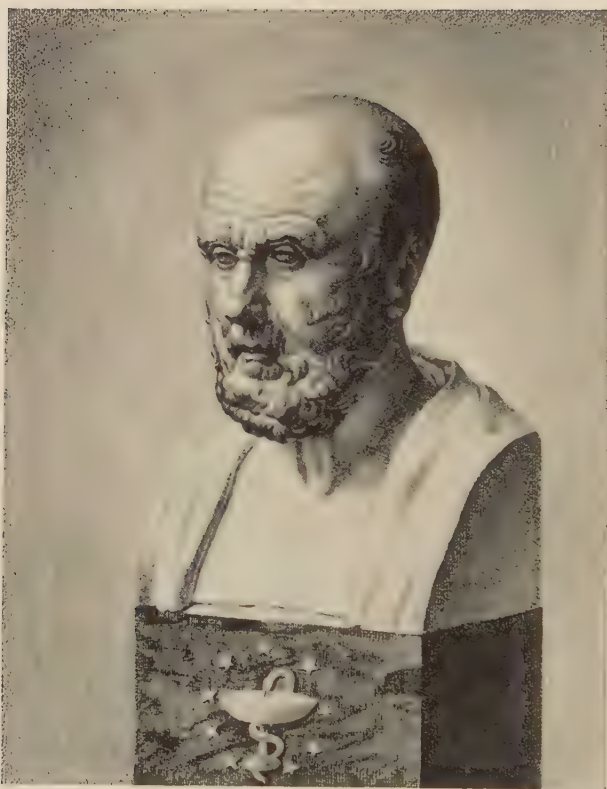


PLATE I. HIPPOCRATES (460-370? B.C.)

HIPPOCRATES

(460-370? B.C.)

BY OLD and established tradition the life of HIPPOCRATES OF COS marks the opening of the era of scientific medicine. The Father of Medicine himself is a tangible figure, on whose history many biographers, ancient and modern, have labored successfully. A more difficult problem, however, has been the determination of those works from his own individual pen. Later Greece and classic Rome were left with a legacy of medical writings which were long accepted as the output of Hippocrates himself. The research of subsequent centuries has established that some of these must have been written before his time and a few after, the majority of the collection accumulating through the greater part of the fifth century B. C. The latest view is that, as it now stands, the assemblage represents the remains of the library of the great Greek medical school of Cos, with which Hippocrates was identified. Certain treatises, including the "Epidemics," the "Airs, Waters and Places," and the surgical works of the collection, are believed to be Hippocrates' own contributions. In any event the group of writings places before us the most enlightened medical thought of the most brilliant period of Greek culture, approximately contemporaneous, as it is, with the works of Sophocles, Euripides, Plato, Thucydides and Herodotus. With this collection of writings was inaugurated the "humoral pathology," which dominated medical thought on the etiology of disease for more than twenty centuries. The selections here reproduced indicate the character of the humoral doctrine, and the Hippocratic teaching on the relation of environment to disease, as well as the care with which the external abnormalities of the sick were noted by this medical school.¹

AIRS, WATERS AND PLACES

X. This, or something very like this, is the truth concerning these matters. As to the seasons, a consideration of the following points will make it possible to decide whether the year will prove unhealthy or healthy. If the signs prove normal when the stars set and rise,

¹ From the translations of the *Works of Hippocrates* by W. H. S. Jones in the Loeb Classical Library, London and New York, 1923.

if there be rains in autumn, if the winter be moderate, neither too mild nor unseasonably cold, and if the rains be seasonable in spring and in summer, the year is likely to be very healthy. If, on the other hand, the winter prove dry and northerly, the spring rainy and southerly, the summer cannot fail to be fever-laden, causing ophthalmia and dysenteries. For whenever the great heat comes on suddenly while the earth is soaked by reason of the spring rains and the south wind, the heat cannot fail to be doubled, coming from the hot, sodden earth and the burning sun; men's bowels not being braced nor their brain dried—for when spring is such the body and its flesh must necessarily be flabby—the fevers that attack are of the acutest type in all cases, especially among the phlegmatic. Dysenteries are also likely to come upon women and the most humid constitutions. If at the rising of the Dog Star stormy rain occurs and the Etesian winds blow, there is hope that the distempers will cease and that the autumn will be healthy. Otherwise there is danger lest deaths occur among the women and children, and least of all among the old men; and lest those that get better lapse into quartans, and from quartans into dropsies. But if the winter be southerly, rainy and mild, and the spring be northerly, dry and wintry, in the first place women with child whose delivery is due by spring suffer abortion; and if they do bring forth, their children are weak and sickly, so that either they die at once, or live puny, weak and sickly. Such is the fate of the women. The others have dysenteries and dry ophthalmia, and in some cases catarrhs descend from the head to the lungs. Phlegmatics are liable to dysenteries, and women also, phlegm running down from the brain because of the humidity of their constitution. The bilious have dry ophthalmia because of the warm dryness of their flesh. Old men have catarrhs because of their flabbiness and the wasting of their veins, so that some die suddenly, while others become paralyzed on the right side or the left. For whenever, owing to the winter being southerly and the body warm, neither brain nor veins are hardened, a northerly, dry, cold spring supervening, the brain, just at the time when it ought to have been relaxed along with spring and purged by cold in the head and hoarseness, congeals and hardens, so that the heat of summer having suddenly supervened and the change supervening, these diseases befall. Such cities as are well situated with regard to sun and winds, and use good waters, are less affected

by such changes; but if they use marshy or standing waters, and are not well situated with regard to winds and sun, they are more affected. If the summer prove dry, the diseases cease more quickly; if it be rainy, they are protracted. Sores are apt to fester from the slightest cause. Lienteries and dropsies supervene on the conclusion of the diseases, as the bowels do not readily dry up. If the summer and the autumn be rainy and southerly, the winter must be unhealthy; phlegmatics and men over forty are likely to suffer from ardent fevers, bilious people from pleurisy and pneumonia. If the summer prove dry and northerly, and the autumn rainy and southerly, it is likely that in winter headaches occur and mortifications of the brain, and in addition hoarseness, colds in the head, coughs, and in some cases consumption as well. But if the weather be northerly and dry, with no rain either during the Dog Star or at Arcturus, it is very beneficial to those who have a phlegmatic or humid constitution, and to women, but it is very harmful to the bilious. For these dry up overmuch, and are attacked by dry ophthalmia and by acute, protracted fevers, in some cases too by melancholies. For the most humid and watery part of the bile is dried up and is spent, while the thickest and most acrid part is left, and similarly with the blood. Consequently these diseases come upon them. But all these conditions are helpful to the phlegmatic, for they dry up and reach winter dried up and not flabby.

EPIDEMICS, BOOK I

XXIII. The following were the circumstances attending the diseases, from which I framed my judgements, learning from the common nature of all and the particular nature of the individual, from the disease, the patient, the regimen prescribed and the prescriber—for these make a diagnosis more favourable or less; from the constitution, both as a whole and with respect to the parts, of the weather and of each region; from the custom, mode of life, practices and ages of each patient; from talk, manner, silence, thoughts, sleep or absence of sleep, the nature and time of dreams, pluckings, scratchings, tears; from the exacerbations, stools, urine, sputa, vomit, the antecedents and consequents of each member in the successions of diseases, and the abcessions to a fatal issue or a crisis, sweat, rigor, chill, cough, sneezes, hiccoughs, breathing, belchings, flatulence, silent or noisy, hemorrhages,

and hemorrhoids. From these things must we consider what their consequents also will be.

XXIV. Some fevers are continuous, some have an access during the day and an intermission during the night, or an access during the night and an intermission during the day; there are semitertians, tertians, quartans, quintans, septans, nonans. The most acute diseases, the most severe, difficult and fatal, belong to the continuous fevers. The least fatal and least difficult of all, but the longest of all, is the quartan. Not only is it such in itself, but it also ends other, and serious, diseases. In the fever called semitertian, which is more fatal than any other, there occur also acute diseases, while it especially precedes the illness of consumptives, and of those who suffer from other and longer diseases. The nocturnal is not very fatal, but it is long. The diurnal is longer still, and to some it also brings a tendency to consumption. The septan is long but not fatal. The nonan is longer still but not fatal. The exact tertian has a speedy crisis and is not fatal. But the quintan is the worst of all. For if it comes on before consumption or during consumption the patient dies.

XXV. Each of these fevers has its modes, its constitutions and its exacerbations. For example, a continuous fever in some cases from the beginning is high, and at its worst, leading up to the most severe stage, but about and at the crisis it moderates. In other cases it begins gently and in a suppressed manner, but rises and is exacerbated each day, bursting out violently near the crisis. In some cases it begins mildly, but increases and is exacerbated, reaching its height after a time; then it declines again until the crisis or near the crisis. These characteristics may show themselves in any fever and in any disease. It is necessary also to consider the patient's mode of life and to take it into account when prescribing. Many other important symptoms there are which are akin to these, some of which I have described, while others I shall describe later. These must be duly weighed when considering and deciding who is suffering from one of these diseases in an acute, fatal form, or whether the patient may recover; who has a chronic, fatal illness, or one from which he may recover; who is to be prescribed for or not, what the prescription is to be, the quantity to be given and the time to give it.

XXVI. When the exacerbations are on even days, the crises are on even days. But the diseases exacerbated on odd days have their

crises on odd days. The first period of diseases with crises on the even days is the fourth day, then the sixth, eighth, tenth, fourteenth, twentieth, twenty-fourth, thirtieth, fortieth, sixtieth, eightieth, hundred and twentieth. Of those with a crisis on the odd days the first period is the third, then the fifth, seventh, ninth, eleventh, seventeenth, twenty-first, twenty-seventh, thirty-first. Further, one must know that, if the crises be on other days than the above, there will be relapses, and there may also be a fatal issue. So one must be attentive and know that at these times there will be the crises resulting in recovery, or death, or a tendency for better or worse. One must also consider in what periods the crises occur of irregular fevers, of quartans, of quintans, or septans and of nonans.

EPIDEMICS, BOOK III

XIII. The severest and most troublesome disease, as well as the most fatal, was the consumption. Many cases began in the winter, and of these several took to their bed, though some went about ailing without doing so. Early in the spring most of those who had gone to bed died, while none of the others lost their cough, though it became easier in the summer. During autumn all took to bed and many died. Most of these were ill for a long time. Now most of these began suddenly to grow worse, showing the following symptoms:— frequent shivering; often continuous and acute fever; unseasonable, copious, cold sweats throughout; great chill with difficult recovery of heat; bowels variously constipated, then quickly relaxing, and violently relaxing in all cases near the end; the humours about the lungs spread downwards; abundance of unfavourable urine; malignant wasting. The coughs throughout were frequent, bringing up copious, concocted and liquid sputa, but without much pain; but even if there was pain, in all cases the purging from the lungs took place very mildly. The throat did not smart very much, nor did salt humours cause any distress at all. The fluxes, however viscid, white, moist, frothy, which came from the head, were abundant. But by far the worst symptom that attended both these cases and the others was the distaste for food, as has been mentioned. They had no relish either for drink with nourishment, but they remained entirely without thirst. Heaviness in the body. Coma. In most of them

there was swelling, which developed into dropsy. Shivering fits and delirium near death.

XIV. The physical characteristics of the consumptives were: skin smooth, whitish, lentil-coloured, reddish; bright eyes; a leucophlegmatic condition; shoulders-blades projecting like wings. Women too so. As to those with a melancholic or a rather sanguine complexion, they were attacked by ardent fevers, phrenitis and dysenteric troubles. Tenesmus affected young, phlegmatic people; the chronic diarrhoea and acrid, greasy stools affected persons of a bilious temperament.

AURELIUS CORNELIUS CELSUS

(ABOUT 30 B.C.-38 A.D.)

ONE OF the most influential texts on medicine made available by the discovery of printing, was the "De Re Medicina" of the Roman AURELIUS CORNELIUS CELSUS. Yet this work was without authority and almost unknown in its own time. The writer appears to have been not a physician but an intellectual patrician, whose interest extended to the domain of medicine. His non-professional status presumably prevented contemporary recognition. Nevertheless the book unquestionably reflects well the current medical knowledge of the period and is valuable for that reason for our purpose here. Unfortunately we are much in the dark as to its originality. Recent investigation of the sources of Celsus suggests that it is not merely a compilation but perhaps even a translation of preceding and contemporary writings. Whatever be the actual original authorship the text is built around the teaching of Hippocrates, the school of Asclepiades of Bithynia and the physicians of the Greek Alexandrian school, with particular stress upon the anatomical point of view of the latter. Practically lost during the Middle Ages, the "De Re Medicina" came to the attention of the medical world in 1443 when Thomas of Sarzanne, who was afterwards Pope Nicholas V, discovered a manuscript of it in Milan. A generation later (1478) it was in print, and within a few years many editions had been put out. The work consists of eight books, of which the fourth and fifth are particularly rich in pathological observation. Book IV, from which the selections below are taken, is essentially a special pathology, in which disease is considered in relation to the individual organs. Celsus' classic reference to the symptoms of inflammation (Book III) is added, the celebrated reference being italicized.¹

DE RE MEDICINA

BOOK IV

I. Thus far those kinds of diseases have been investigated, which are so seated in the entire body, that no particular situations

¹ From the translation by G. F. Collier, London, 1840.

can be assigned to them: now I shall speak of those which are partial. But the diseases of all internal parts, and their cure, will be better understood when I shall have previously pointed out their relative situations.

THE HEAD therefore, and parts contained in the mouth, are not merely bounded by the tongue and palate; but also by the external visible parts. To the right and left of the throat are large veins, which they call *σφαγίτιδες* (sphagitides); and arteries also, which they call *καρωτίδας* (karotidas), taking their course upwards, are continued beyond the ears. But in the neck itself glands are seated, which sometimes become painfully enlarged.

Then begin two passages: one they call the *arteria aspera* (or TRACHEA), the other the Esophagus. The trachea being external, reaches to the lungs; the esophagus internal, goes to the stomach: the former is for the reception of air, the latter for that of the food. Now, since these passages are distinct, just where they meet, there is a small tongue upon the trachea, at the entrance of the fauces, which is elevated while we breathe, but, when we are in the act of taking food, or drink, closes up the trachea.

Now the TRACHEA, being hard and cartilaginous, rises in the throat, and retreats in the remainder of its course. It is made up of certain circles, arranged in the form of the vertebrae of the spine; in such way, however, that it is rough externally, and internally smooth like the esophagus; and taking a direction downwards toward the praecordia, it is connected with the lungs.

The LUNG is spongy, and therefore capable of containing air; and being connected to the spine posteriorly, is divided into two portions, in the manner of an ox's hoof. Attached to this is the HEART, which is of a muscular nature, situated in the chest under the left breast; and it has, as it were, two ventricles. But below the heart and lungs there is a transverse septum formed of a strong membrane, separating the abdomen from the praecordia, being of a tendinous structure, and having a number of vessels dispersed on it: it separates not only the intestines, but the liver and spleen from the upper parts. These viscera are in proximity with it, but have their position below, on the right and left. The LIVER, commencing on the right side under the praecordia, and immediately below the septum, is internally concave, externally convex; this being prominent, slightly rests on the stomach, and is divided into four lobes. Inferiorly the GALL BLADDER adheres to it: but the SPLEEN

on the left, being connected with the intestines, and not with the same septum, is of a soft and exceeding porous structure, and of a moderate length and thickness; and emerging slightly from beyond the margin of the ribs into the abdominal cavity, is principally buried under them: and these three organs are joined. But the KIDNEYS are separate, adhering to the loins below the last ribs, rounded at the margin opposed to the ribs, and crooked at the other side: they are vascular, have small cavities, and are invested with tunics. And such are the relative situations of the bowels. The OESOPHAGUS, which is the beginning of the intestines, arises nervous from the seventh vertebra of the spine, and is united with the stomach about the praecordia. But the STOMACH, which is the receptacle of the food, is made up of two coats, and is situated between the spleen and the liver; each of these last extending somewhat over it. There are also thin bands, by which these three parts are connected together, and joined to that septum, which I have above described as transverse. Then, the lower part of the stomach turning a little to the right, is narrowed till it forms the uppermost intestine. This junction the Greeks denominate *πυλωρόν* (puloron,) because it allows of the escape of the egesta into the parts below, in the manner of a portal. From that begins the jejunum, which is an intestine moderately convoluted, and so called because it never retains what it receives, but immediately transmits it to the parts below. The next is the slenderer intestine, highly convoluted, each convolution being connected with those which are more internal to it by means of slight bands; which being turned towards the right side, and ending in the region of the right hip, do nevertheless principally occupy the upper part. Afterwards, this intestine is joined by another thicker transverse one, which commencing at the right side, is pervious and long towards its left, but not so towards its right side; and is on this account denominated caecum. But that part which is pervious being of large compass, sinuated, less nervous than the upper intestines, disposed in flexions on either side, but occupying the left more than the right, touches the liver and the stomach: it is then connected by small membranes which proceed from the left kidney, and making a curve to the right, it is directed downwards, where it empties itself, and on that account there takes the name of "intestinum rectum." Now the omentum covers all these organs, being smooth and narrow at its lower, and softer at its upper portion: and fat also forms on it, which is of an insensible nature, like the brain and marrow. But

from either kidney single vessels of a whitish colour take their course to the bladder: these the Greeks call *οὐρητῆρας* (oureteras), from the notion that the urine, descending through them, distils into the bladder. The bladder, nervous and double at its fundus, but full and fleshy at its cervix, is connected by veins to the intestines, and to that bone which lies under the pubes; while in itself it is detached and free; not having the same situation in males as in females: for in males it is in juxtaposition with the rectum, inclined somewhat to the left side; in females it is placed above the genital organs, and is supported as it hangs by the uterus itself. Again, in males the urethra is longer, and narrower from its neck to the penis; in females it is shorter and wider, and shows itself above the neck of the womb.

In virgins the WOMB is exceedingly small; nay, even in married women, unless when they are pregnant, it does not exceed a hand's grasp. It arises opposite to the middle of the belly, being provided with a straight and narrowed neck, and has a slight inclination towards the right hip; then, advancing over the rectum, it is connected at its side to the woman's ilia. The ilia themselves are situated between the hips and pubes, at the lower part of the belly. From these and the pubes, the abdomen reaches upwards to the praecordia; externally, it is covered by the skin which is visible; internally, it is lined by a fine membrane, called by the Greeks *περιτόναιος* (peritoniaios), which is connected to the omentum.

II. 1. Having, after a fashion, afforded a view of these parts so far as is necessary to the practitioner, I shall recount the remedies for the disorders of each, commencing with the head; which last term I confine to so much of it as is covered with hair: for disorders of the eyes, the ears, the teeth, and the like, remain to be explained elsewhere. Now the head is subject to an acute and dangerous disease which the Greeks call *κεφαλαίαν*; the characteristic marks of which are strong shivering, nervous relaxation, dimness of sight, delirium, vomiting, together with a suppression of the voice; or nasal hemorrhage, with coldness of the body, and fainting: besides these symptoms there is a violent pain, chiefly about the temples or occiput. Moreover, sometimes a chronic weakness of the head endures for a person's life, although neither severe nor dangerous: sometimes the pain is of a severer kind, but temporary, and not of a fatal character; which last is contracted by indigestion, or by cold, or by heat, or by insolation. And all these pains occur sometimes with, and

sometimes without fever; sometimes in the whole, and sometimes in part of the head; and sometimes excruciate also the most contiguous part of the face.

In addition to these, there is yet another kind met with, which may be chronic: in this a humour distends the skin, so that it swells, and yields to the pressure of the finger: the Greeks call it *ὕδροκεφάλον* (hydrokephalon).

* * *

4. Sometimes a HUMOUR DISTILS FROM THE HEAD into the nose, which is unimportant; sometimes into the fauces, which is worse; and sometimes even into the lungs, which is the most dangerous. When it has distilled into the nose, a thin rheum flows from it, there is a slight pain, and a sense of weight in the head, and frequent sneezings: when into the fauces, it irritates them, and produces a slight cough: when into the lungs, besides the sneezing and cough, there is head-ache, lassitude, thirst, heats, and bilious urine.

* * *

III. We pass from the head to the neck, which is subject to very severe diseases. Neither is there any disease more troublesome and acute than that which, by a certain rigour of the nerves, at one time approximates the head to the shoulders, at another the chin to the chest, and at another keeps the neck on the full stretch, erect and immoveable. The Greeks call the first *ὀπισθότονον* (opisthotonon), the next *ἐμπροσθότονον* (emprosthotonon), the last *τέτανον* (tetanon), or TETANUS; although some use these less scientifically as synonymous terms. They often prove destructive before the fourth day: if the patients live beyond that, they are safe.

IV. 1. Now as the last affection occurs in the entire neck, so another, equally dangerous and acute, is wont to happen in the fauces. Our countrymen call it angina, or quinsy: the Greeks name it according to the species; for sometimes there is no evident redness or tumour; but the body is arid, and the breath fetched with difficulty, the limbs debilitated: this they call *συνάγχην* (synancheen). Sometimes the tongue and fauces are swollen and red, the voice suppressed, the eyes turned, the face pallid, and there is hiccough: this is called *κυνάγχη* (kunanche). Both have these following symptoms in common: the patient cannot swallow food or drink; and his breathing is obstructed.

2. There is also an affection about the fauces, variously named by the Greeks, according to its intensity. It is entirely confined to a difficulty of breathing: but so long as this is moderate, and produces no sense of constriction, it is called *δύσπνοια* (dusпноia); when more violent, so that the patient cannot breathe without noise and anhelation, *ἄσθμα* (asthma); and when he cannot respire except with the neck erect, *ὀρθόπνοια* (orthopnoia). Of these, the first is usually of long continuance, the two following acute.

The symptoms common to these are, a hissing sound, on account of the narrowness of the respiratory passage, a recurrent pain in the chest and praecordia, and sometimes in the shoulders; to these accedes cough.

* * *

5. There is reason to be more alarmed when one spits blood; although that is at one time attended with less, and at another with more danger. Sometimes it proceeds from the gums, sometimes from the mouth; and from the latter sometimes even copiously, although without cough, without ulceration, and without any disease of the gum, so that there is nothing hawked up. In fact, as it sometimes issues from the nostrils, so likewise from the mouth. Again, sometimes true blood flows, at others a matter resembling water in which flesh has been recently washed. But sometimes it proceeds from the upper part of the fauces, and occasionally with ulceration in that part; sometimes, even without an ulcer, it proceeds from the open mouth of a vessel, or it issues from tubercles which have arisen in these parts. When this is the nature of the case, neither food nor drink occasions pain, nor is any matter excreted from the ulcer. But sometimes the throat and bronchiae being in a state of ulceration, a frequent cough expels blood also: while it is wont sometimes to be given off even from the lungs, or the chest, or the side, or the liver: women who have no regular menstruation frequently spit blood.

There are medical authors who say that haemorrhage proceeds from an eroded, or from a ruptured part, or from the open mouth of a vessel. They call the first *διάβρωσιν* (diabrosin); the second, *ῥήξιν* (rhexin); the third, *ἀναστόμωσιν* (anastomosin). The last is the least, and the first the most hurtful; and it often happens that pus is discharged after the blood. Now, sometimes he who has stopped the bleeding has done sufficient for the recovery. But when

ulcers ensue, or if there is pus, or a cough, the disorders are various and dangerous, according to their situation. When merely blood is discharged, both the remedy and the termination is expeditious. Nor ought we to be ignorant, that to those who have an habitual hæmorrhage, or to those who have pains in the spine or hips, or after strong exercise or walking, so long as there is no fever, a moderate flux of blood is not prejudicial; that when voided with the urine, it even removes lassitude; nay, that it is not alarming in one who has fallen from an eminence, if nothing else unusual be observed in his urine; that vomiting of blood carries no danger with it, even when recurrent, when the body has time to regain strength and flesh; and that there is not the slightest danger, when it occurs in a robust habit, without being excessive, and without exciting cough, or increased heat. These remarks apply to all the species.

* * *

V. Just below the fauces is the stomach, in which several chronic affections not unusually occur: for sometimes there is a great heat, and sometimes a flatulency affects it; at others, inflammation or ulceration; sometimes phlegm, and at others bile arises there; but the most frequent malady of this part is that in which it is resolved; nor is there any affection by which it is more disturbed, or in its turn produces greater disturbance of the whole body.

* * *

VI. The stomach is bounded by the sides, and in these also violent pains not unusually happen; and they take their origin either from cold, or from a blow, or from immoderate running, or from disease. But occasionally the affection is limited to pain: and that is sometimes slowly, sometimes rapidly brought to an end; now and then it is even of a fatal character, and an acute disease arises, which is called by the Greeks *πλευριτικός* (*pleuritikos*). To this accede pains of the side, fever, and cough: and by this last, when the disease is moderate, phlegm is expectorated; when violent, blood. Sometimes also the cough is dry, and forces up nothing: that symptom is more dangerous in the first affection, and less so in the second.

* * *

VII. From the frame of the body we pass to the viscera; and first to the LUNGS: here a violent and acute disease arises,

which the Greeks call περιπνευμονικὸν (peripneumonikon). The nature of it is as follows: the whole of the lungs is affected; upon this state ensues a cough, carrying with it bile or pus; a weight of the praecordia, and of the entire chest; difficulty of breathing, severe febrile paroxysms, constant watching, loathing of food, and tabes. This kind of malady is more dangerous than painful.

* * *

VIII. There is a disease also of another viscus, that is of the LIVER, which is in like manner prone to be sometimes chronic, and sometimes acute; the Greeks call it ἥπατικὸν (hepatikon). There is a violent pain under the right praecordia, reaching up to the thorax, and to the throat, and upper arm of the affected side: sometimes also the right hand is tormented with pain; there is a strong shivering: when it is severe, bile is vomited up; sometimes hiccough almost strangulates the patient. And these are the symptoms of the disease when acute. When there is suppuration in the liver, it is of a more chronic character; the pain is now ended, and now becomes more intense; the right praecordia become hard and swollen; there is greater difficulty of breathing after food; and some resolution of the jaws accedes. When the disorder has grown inveterate, the belly, legs, and feet begin to swell; the chest, upper arms, and parts about the throat, on both sides, become extenuated.

* * *

IX. But when the SPLEEN is affected, it swells, as does likewise the left side; and this last is hard and renitent: the bowels are tense: there is also some tumidity in the legs: the ulcers either do not heal at all, or certainly cicatrise with difficulty: in active walking and running there is a pain, with some sense of uneasiness.

* * *

X. But when the KIDNEYS have been affected, they remain disordered for a long time: and it is a worse case when bilious vomiting accedes.

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XI. From the VISCERA we come to the INTESTINES, which are liable both to acute and chronic distempers. Cholera must first be mentioned; because that would appear to be a disease

common to the stomach and intestines. For there is at the same time both purging and vomiting: and besides these there is flatulency, the intestines are griped, there is an eruption of bile both upwards and downwards, at first like water, and afterwards appearing as though recent flesh had been washed therein; sometimes white, at others black or vari-coloured. Hence the Greeks have named the disease *χολέραν* (cholera). Besides the symptoms above mentioned, the legs and hands are also often contracted; there is urgent thirst, and fainting: nor is it surprising that, under such an assemblage of symptoms, sudden death ensues.

* * *

XII. Now this disease is in fact of an acute character; and, since it is both situated in the intestines and the stomach, it is no easy matter to say to which part it chiefly belongs. But that which is called by the Greeks *κοιλιακὸς* (koiliakos), is seated at the pylorus of the stomach, and is usually chronic. Under this affection, the abdomen becomes indurated, and pain is felt there. The bowels void nothing, not even wind; the extremities become cold; the breath is expired with difficulty.

* * *

XIII. There are two distempers whose seat is limited to the intestines themselves; the one to the smaller, the other to the larger. The first is acute, the last may be chronic. Diocles, the Carystian, named the disease of the smaller gut *χόρδαψον* (chordapson), that of the larger *εἰλεὼν* (eileon). I observe that by most persons the former is now called *εἰλεὼν*, the latter *κολικὸν* (kolikon). Now the first sometimes excites pain above, and sometimes below the umbilicus. Inflammation occurs in either part: neither stools nor wind is passed downwards: if the upper part be affected, food is voided by the mouth; if the lower, faeces; if both, the case is inveterate. The danger is aggravated by a bilious vomiting of a bad odour, whether various or black.

* * *

XIV. Now the malady which is situated in the larger intestine, generally happens in that part which I have described as the caecum. There is great flatulency; severe pain, especially in the right side; the intestine, which seems to be inverted, almost deprives the patient of the power of breathing. In most cases, it arises after

chills and crudities, and afterwards subsides; and frequently recurring in the course of one's life, it embitters, without shortening it.

* * *

XV. Next to these is a common affection of the intestines, called GRIPES, and by the Greeks *δυσεντερία* (dysentery). The intestines are ulcerated internally; cruentate blood flows from them; and that sometimes with faeces uniformly liquid; at others with mucous excretions: occasionally also some fleshy matter comes away: there is frequent desire for stool, and pain in the anus: with this pain there is some trivial excretion; and by that also the anguish is increased: this after a time is somewhat alleviated, and there is a slight interval of ease: sleep is interrupted; some fever arises; and when the disease has grown inveterate, it either destroys the patient, or, even though it be cured, torments for a considerable time.

* * *

XVI. After dysentery sometimes a LIENTERY arises; in which the intestines can retain nothing, and quickly discharge in an undigested state whatever has been eaten. This is sometimes of long continuance, and sometimes rapidly destroys.

* * *

XVII. Moreover, WORMS also sometimes infest the bowels; and these are sometimes discharged downwards, and, what is more disgusting, sometimes by the mouth; and sometimes we observe them to be broad, which are the worst; and sometimes round.

* * *

XX. 1. In females, a violent disease arises in the womb also; and next to the stomach, this part is most sympathetically affected by, and most sympathetically affects the rest of the system. Sometimes also it so completely takes away the senses, as to occasion the patient to fall, as if in epilepsy. The case, however, differs in that the eyes are not turned, nor does froth issue forth, nor are there any convulsions: there is only a deep sleep. The affection in some women returning frequently, becomes permanent.

* * *

XXI. There is also an affection in the generative organs; an excessive seminal discharge, which is given off without sexual

intercourse, without nocturnal dreams, to such an extent, that in time it destroys the person by a *tabes*.

BOOK III

But when there is inflammation and pain in the *praecordia*, repressing cataplasms are to be used first; lest the hotter kind determine more humour there: directly the inflammation is diminished, we advance to the hot and humid sort, to discuss the relics of the disease. *Now the characteristics of inflammation are four; redness and swelling, with heat and pain:* wherefore, Erasistratus was greatly mistaken in saying there is no fever without inflammation. If, therefore, there be pain without inflammation, nothing need be applied externally, because the fever will of itself discuss it. But when there is neither inflammation nor fever, but merely a pain in the *praecordia*, we must immediately have recourse to hot and dry fomentations.

GALEN

(129 - 201 A.D.)

THE MOST gifted and celebrated investigator of physiological and pathological phenomena in classical antiquity was GALEN, a Greek born in Pergamus, Asia Minor, whose output of medical and related treatises so impressed contemporaries and successors as to become stamped with an authority soon absolute, and ultimately almost divine. Educated at Alexandria, Galen practiced medicine most actively and profitably at Rome, where he also taught, and at the same time carried on animal experiments with amazing industry. The results of his professional activity are embodied in a stupendous collection of writings covering a wide range in anatomy, physiology, pathology, pharmacy and therapeutics, as well as a variety of subjects outside the field of medicine. His works of most importance in the history of pathology are those on the "Parts Affected," the "Natural Faculties," "Abnormal Tumors" and the "Therapeutic Method." In the Middle Ages these formed the standard teaching on the nature of disease, rivalled only by Avicenna's "Canon." The advent of printing, which made many editions of Galen's works available further enhanced his reputation. In pathology Galen stands as the interpreter and codifier of the humoral doctrines of the Hippocratic school, and as the first great experimental pathologist. Selections from the mass of his writings have been chosen here which illustrate his views in both general pathology (edema, jaundice, inflammation) and special pathology (diseases of the urinary organs and diabetes.)¹

HOW THE DIAGNOSIS OF AFFECTIONS OF THE SPLEEN DIFFERS BUT LITTLE FROM THAT OF AFFECTIONS OF THE LIVER. SYMPTOMS AND OCCURRENCES MANIFESTED WHEN THE SPLEEN SUFFERS FROM ATONY. ICTERUS AND THE DROPSIES SUPERVENING WHEN THE SPLEEN AND THE LIVER ARE AFFECTED SIMULTANEOUSLY OR FOLLOWING A SIMPLE DYSCRASIA. DIFFICULTY OF CERTAIN PHYSICIANS IN EXPLAINING THESE FACTS.²

¹ Translated by William H. Wilder, Jr., from the French of Ch. Daremberg's edition of the *Works of Galen*. (Paris 1854-6).

² From *The Parts Affected*.

On the basis of what I have just said concerning the liver, it will not be difficult to recognize the indications by which affections of the spleen are diagnosed; but we must add that inflammations of this last named organ are easy to detect by palpation because of the hardness that accompanies them. Diseases of the spleen have much in common with those of the liver in their symptoms, differing only in having these in greater or less degree. If the spleen is affected with atony, the color of the entire body turns black, since the natural function of the spleen is to draw to itself from the liver the blood charged with black bile, blood with which it nourishes itself, as we have shown before (*On the Use of Parts*, IV, 4 and 15). When its power of attraction is struck by atony, the blood coming from the liver is distributed throughout the whole body without being purified; consequently the skin assumes a black color. Nevertheless the spleen, in the same fashion as the liver, often expels certain superfluous matter from its interior, so that one frequently sees a blood charged with black bile vomited forth with nausea, or a similar blood ejected in the stools. It also happens that in the absence of such evacuations there is present either a depression, and melancholy sadness accompanied by an intense desire for foods, especially if extremely acid waste-matter is being carried in the stomach, or an upsetting and collapse of this organ, if the waste-matter is subject to another type of corruption.

It has been told before how a spleen affected with scirrhus gives rise to dropsy when the liver is affected at the same time. Still when it happens that the two organs are simultaneously affected, we have seen jaundice occur, a jaundice more inclined to black than is customary, so that one might think that the yellow bile was mixed with soot. Some physicians, thinking that in this case the liver is not free from disease, cannot explain to their satisfaction why certain forms of jaundice depend on the spleen; the case is the same with those who think that patients become dropsical only because of the scirrhus state of the spleen and without disease of the liver. These physicians are in the same difficulty in the case of dropsies occurring in acute illnesses, illnesses where, because of extreme exposure to heat or cold, the liver is so severely affected that it can no longer convert the food into blood. Indeed, they do not even judge the liver to be affected in this case, since they, along with Erasistratos, have formed the habit of not regarding a part as diseased where there is present neither tumor nor

ulceration. Such a point of view may be allowed those physicians who hold that no disease can come from dyscrasia; but as to those physicians who go by evident phenomena and who, as a result, are of the opinion that certain symptoms are manifest when a part is cooled off, are they not to be wondered at when they think a dropsy cannot take place without some spot being affected? Indeed if they think that the liver is by no means affected where there exists no unnatural tumor in this organ, they will find that there will be no other affection when one acquires the dropsy after having drunk a great deal of bad and cold water immoderately. Cold water drunk in this way injures some interior part, now one, now another, one more seriously than the others, one before the others, according to which part it finds weakest at that moment. If the result is to be a tendency toward dropsy the cold will pass into the liver. In the same way the spleen may give rise to a dropsy (through the intermediary of the liver), either when it is chilled by tumefaction, as in a scirrhus, or without tumefaction, as in the case where one drinks bad cold water in great quantities at an unfavorable time. We have mentioned above, while treating the subject, that melancholia is evident when the spleen sends a melancholy waste-matter to the orifice of the stomach, so that we have nothing to add concerning the liver, since the organic injuries that develop there do not require a diagnosis founded upon reason (since they are evident to the senses). As for dyscrasial affections, they may be recognized by what has just been said or by our observations on diseases of the liver. Indeed, certain diseases have been described by name; others, occurring in the same way, are also recognized in the same fashion.

ON INFLAMMATION¹

Now, Glaucon, I shall explain the affections of each part of the body, beginning with inflammation. It is, indeed, the most frequent affection and the one showing the greatest number of varieties. All these inflammations are of a kind accompanied by fever. An excessive heat and a sort of burning ardor are therefore common to all of them, whence the habit of the ancients of making use of the word "inflammation," φλεγμονή. You will find in every one a characteristic difference, and through that you will recognize the form of inflammation and will find the treatment that suits it.

¹ From *The Therapeutic Method*.

Indeed you will treat differently herpes, erysipelas, phygethlon, and all forms of inflammation. So you must be able to diagnose the affections beforehand with correctness here also. It is this I shall first try to show by discussing the variety of all inflammations from the beginning.

The first division of inflammations is into moist and dry. Moist inflammation comes from a hot flux invading the part in question. Dry comes when, without any flux, the natural heat becomes active. It is, up to a certain point, a kind of fever of the part which, having reached an excess of heat and dryness, brings about complete destruction and mortification of the part. Nor can this variety be subdivided any further like the other variety where, we say, certain humours flow to the part. This latter indeed offers several appearances. One is a flux of blood, the other a flux of yellow bile, a third the two types of flux united. In each of these cases the affluent humour is already putrefied, or else becomes putrefied once fixed in the part. This humour has a thick or thin, mild or sharp consistency. So if a useful blood of average thickness flows rapidly to one part and is kept there because of its excessive quantity, a sharp pain is felt by the individual, if the sensibility of the part is not entirely gone. A painful pulsation is felt in the depths of the part, and the patient thinks he feels a tension in all directions, a compression, and a violent heat so great he believes he is afire and desires to be cooled. Redness is also noticeable, the kind of efflorescence one sees in people who have just left the bath or who have warmed themselves at a fire or in some other manner. This affection has received the name of the entire class in the same way that many other varieties take the name given the class, and is called inflammation.

Inflammation occurs frequently and for nearly every kind of reason. Tears, contusions, ruptures, the lassitude resulting from gymnastic exercise, luxations, fractures, and spontaneous ulcers, give rise to inflammation. Independently of all these causes inflammation arises when the veins, being overly filled with humours, spread whatever is superfluous into the region best prepared at that time to receive it. This part is of necessity weaker than the others, or more spongy, has greater attractive power, or is less mobile—but whatever the cause of these various conditions it is not our aim to discuss it here.

When the yellow bile, retaining its nature, spreads through all

parts of the body with the blood, the affection is called jaundice; when this bile is excreted alone and becomes located in one part, the affection takes the name of herpes. If it is of a thick consistency it ulcerates all the skin down to the underlying flesh. Hippocrates calls this type of herpes "esthiomenous herpes." If the bile is less thick it only burns the surface of the skin, and this type has taken the generic name of the whole class, being simply called "herpes." Indeed, of the two other kinds, the one, mentioned above, is called *esthiomenous herpes* and the other *miliary herpes*, because it gives rise to numerous and small phlyctenae much resembling millet seeds on the surface of the skin. Such a herpes is also caused by the bile, but by a bile less sharp and warm than that causing the preceding herpes.

If the flux consists of blood and bile hotter than is necessary, or of a boiling blood of very thin consistency, the affection is called "erysipelas," a much warmer ailment than inflammation and one of a yellower aspect. If you press down with your finger the blood easily leaves and then returns very thick and red; yet erysipelas is not as painful as an inflammation. Nor does it produce a pulsation, compression, or tension comparable to that of any kind of inflammation. Sometimes it only disturbs a little, especially if it is only on the skin and does not attack the underlying flesh. This is the most frequent manifestation and is pure erysipelas. When it penetrates the underlying flesh and is not caused by a purely tenuous flux, it is no longer an erysipelas but a diathesis composed of both erysipelas and inflammation. At times symptoms of erysipelas will dominate in this diathesis, and such an affection is called "inflammatory erysipelas" by our modern physicians; at other times inflammatory symptoms dominate, it is then called an "erysipelatous" inflammation. If the symptoms of neither one nor the other are clearly predominant, but seem to be equal, it is said to be a "mixture of erysipelas and inflammation." So we see that true erysipelas is only an affection of the dermis itself, whereas inflammation is not an affection limited to the parts underlying the dermis, but principally of these and sometimes of the dermis as well. This inflammation moreover is in no way less painful than the other, but the pulsation is not felt.

When the flux of blood is very warm and very thick, it burns every part to which it flows suddenly, and gives rise to an ulcer with an eschar. It also raises all the margins with an excessively

painful and boiling inflammation. Such an affection is called "carbuncle." When the affluent blood is black, thick, muddy, and boiling, like the blood we have just mentioned, and when at the same time it contains a mixture of tenuous pus, it raises phlyctenae like those caused by fire on the surface of the skin, giving rise to crusted ulcers when they are broken. This also is carbuncle. Inflammation can be subdivided into such groups according to the nature of the affection.

One who is deceived by the multitude of names, might think that many groups have been omitted, e.g., "buboes," "phymata," "phygethlons," "ophthalmias," "peripneumonias," "pleurisies," and other numerous affections named in this fashion. As a matter of fact these affections are inflammations included in the classes indicated above, each one of which has received a separate name, those who first named them having wished to designate simultaneously with one name the affection and the part affected. In fact, bubo, phyma, and phygethlon are affections of the glands. Bubo is an inflammation. Phyma is an affection that grows and quickly ends in suppuration. Phygethlon is the affection called "phlegmonous erysipelas" or "erysipelatous inflammation." In the same way also ophthalmia is an inflammation of the membrane adhering to the cornea; pleurisy that of the membrane that covers the ribs; quinsy that of the pharynx; peripneumonia that of the lung. The same thing holds true for each of the other names.

It is easy to recognize inflammation of visible parts of the body; it is not as easy to recognize that of hidden parts, which necessarily gives rise to fever. This type of diagnosis seems to me to require delicacy of judgment and that knowledge of the nature of the parts given by dissection and exact understanding of their functions and uses. We have spoken of these matters in other treatises. We cannot now return to these questions, since a sudden necessity forces you, Glaucon, to absent yourself. But I shall set down the best treatment of inflammation arising in the visible parts, beginning with that affection which is so frequent that it has taken the name of the entire class. But I think that we must first put into practice a precept of highest importance in all affections, that is first find the cause of the illness.

* * *

ON CALCULI, ABSCESS, ULCERATION OF THE KIDNEYS, AND THE MATERIAL EXCRETED IN THE URINE IN DIFFERENT AFFECTIONS.

ON DIABETES. LONG DISCUSSION ON THE RELATIONS BETWEEN THIS DISEASE AND LIENTERY AND OTHER PATHOLOGIC STATES OF THE INTESTINAL CANAL. ORIGIN AND SYMPTOMS OF DIABETES.¹

When nephritis breaks out suddenly because of the obstruction caused by a large stone in the kidneys or in the ureters, the pains are similar to those of colic; but the latter are distinguished by the frequency and severity of nausea and by the fact that the vomited matter is bilious, phlegmatic, and mixed with some particles of food.

It often happens that the pain is not restricted to one part, but winds about and spreads to further parts. Nor is there any escape of gas. All these symptoms are common to colic affections, some in greater degree, some in lesser. When the disease is distinctly indicated, either by the nature of the urinary deposit or by the emission of a calculus, no further examination need be made. Many patients at first feel only a moderate and deep pain in the region of the flanks and do not pass any visible stones. In this case, as you know, one must administer medicaments able to break up the stones in the kidneys, for, not only do these medicaments lead with certainty to a diagnosis of the affection and the affected place, but they also constitute the first steps of treatment. If, after the administration of this treatment one finds some sandy matter in the urine, then I recognize a case of nephritic affection and prescribe a continuance of the treatment and the addition of other methods. Once you have recognized the disease, if pains are present, accompanied by chills reappearing at irregular intervals, and if there is a certain irregular fever, then, after having made the patient lie for a while, first on his stomach, then on his side, see if he does not seem to feel a sort of weight hanging from the kidney where the seat of the pain is. If this is the case, you must conclude that an abscess has formed. When this abscess ripens, the pus escaping from it to the exterior will alleviate the pain, but there is danger of ulceration of the kidneys. Therefore, it is necessary to try to bring about cicatrization by every possible means, but if this result cannot be obtained the affection becomes very hard to cure.

One can easily recognize the signs of a persistent ulceration by inspection of the urinary matter and by the fact that the patient often feels pain in the region of the affected kidney. Sometimes a small amount of pus escapes, as if from an ulcer, or what is appar-

¹ From *The Parts Affected*.

ently a false membrane (*ἐφελχίς*), and sometimes blood, which is an indication of an ulcer with erosion. Blood in abundance is urinated also when a vessel has burst because it is too full, or because of a fall or some violent blow; this is seen again when the orifice of a vein has opened in these regions. The indications of ulcer of the kidneys themselves are quite certain: small pieces of flesh are passed with the urine; these are little particles of the kidney itself torn away because of the spread of the erosion that accompanies the ulceration. Hippocrates saw these particles of flesh, much like hairs, passed with the urine, as he remarks in his *Aphorisms* (IV, 76). I myself have seen these bits of flesh, sometimes a cubit long, sometimes longer, and at times so long that I asked myself with astonishment whether such bodies could be contained in the cavity of the kidney. Because of that it seems more probable to me that those particles of flesh came from the veins in the same fashion as, in certain countries of Arabia, "dragons" are formed in the legs, the products of a nervous constitution, but much resembling worms in color and thickness. I have heard several people relate that they have confirmed facts of this nature. As for myself, never having seen any, I can make no exact conjecture on the origin or the nature of these products, but, having examined the piliform substance passed with the urine, I have agreed with those who, taking into consideration the color and consistence of these substances, think them to come from a thick and viscid humour which coagulates on becoming warmed and dries in the veins; nevertheless I am unable to explain their length. The first time I observed these facts I hoped to attain a cure by diuretic drugs; my hopes were realized.

With nearly all the patients who had experienced these accidents there had been no antecedent nephritis, nor did any symptoms occur after they had been cured by diuretics. When some other noxious humour is passed from the veins in the urine I have never seen the kidneys, the bladder, or the ureters affected at the same time; the same holds true when abundant amounts of pus are passed in the urine. Things are the same here as in the intestines, which suffer in no manner from the hepatic diathesis, although they are injured when they are in contact with pure bile. In the same fashion the bladder is ulcerated by the passage of irritating urine.

There is still another affection of the kidneys, which consists in the emission with the urine of the ichor held by the blood, an ichor much resembling the excremental matters that are seen in the first

stages of diseases of the liver, except for the fact that this ichor is a trifle more bloody. This affection comes from a certain diathesis of the kidney, much like that we called "atony" in the liver, or from the distension of the bodies or passages (call them what you will) that filter the urine from the vena cava into the kidneys.

The kidneys also seem to me to be affected in the disease that some call "dropsy of the chamber-pot," others, "urinary diarrhoea," "diabetes," or "ardent thirst," (*διψαχός*); this last is a disease that is extremely rare. I myself have seen it only twice to date. The patients had an unquenchable thirst; they drank immoderately and passed the liquid they had imbibed through the urine in the same condition as they had drunk it. This disease in the kidney and bladder is analogous to diarrhoea in the stomach and intestines. In another place I have treated diarrhoea in detail and have shown that in this affection not only the stomach, but also the entire intestinal canal, is too promptly incited to expel food and drink that cannot be quietly contained, even for a short time, because of either the weight or quality of the matter taken in. It is impossible to hold an atony of the stomach, the jejunum, or the small intestine responsible for the quick and sudden passing of urine through the bladder. In truth if these organs cannot hold liquids, and tend to expel them as soon as they are taken in, it might be asked, what would keep this liquid from escaping through the stool, as we observe in a diarrhoea? For in this case it is not only food, but also drink, that so rapidly traverses the complicated coils of the intestine. We have learned that the distribution of food that takes place from all parts of the intestinal canal into the liver does not take place because of atony of the liver, nor is it the result of atony of the veins that are found in the mesentery, those found in the stomach, or those going from the kidney to the liver (through intermediary of the vena cava). We have, indeed, showed in our treatise *On the Natural Faculties* that the liver draws the food-stuff from the stomach to itself with the assistance of the mesenteric veins, just as trees draw food from the earth with their roots; we have shown that the kidneys draw the aqueous part of the blood, but that the bladder does not draw anything from the liver any more than the intestines draw from the stomach. On the contrary, the kidneys send their secretions to the bladder through the ureters; the stomach transmits its secretions into the jejunum through that extension towards the intestine (q. v. *Use of Parts*, IV, 7)

which Herophilos has called the duodenum, because he found it to be twelve finger-breadths long. For these reasons one might give atony of the kidney as a cause when it is unable to hold urine, but not the atony of other parts through which the liquid passes. On the other hand, if one says the kidneys are atonic, how explain the fact that they draw urine to themselves so rapidly? One might reply: In the same way as a violent appetite is evident in certain diarrhoetic people, so there occurs in the kidneys a violent desire, because of which these organs attract urine through the vena cava and are overburdened by the abundance of the liquid. We also see people affected by a canine hunger fill themselves in one swoop and then vomit or be taken with diarrhoea a short while afterwards. This is observable, not only in a state contrary to nature, but also in certain animals that enjoy perfect health, for example in some birds which in Asia we call "Seleucides," who eat grasshoppers to satiety all day and vomit them as soon as they have eaten them. This natural phenomenon can be observed in still other animals. In the same fashion, when a violent hunger declares itself at the orifice of the stomach, and the latter is unable to support the new amount taken in, it is obliged to put down avidly a great quantity of matter and throw it up at once. So, in this manner, when an intense desire for the serous fluid arises in the kidneys at the same time that the retentive faculty is affected with atony, it is necessary for them to draw in a large quantity of urine at a time and discharge it immediately into the bladder. But why, one may ask, does a urinary diarrhoea declare itself at once, whereas this is not the case with lientery or canine hunger, which take several days to declare themselves, since the beginning is distinguished by an augmentation of the usual maximum. This can be explained by the fact that appetite for food is a psychic reaction of the stomach that never takes place without our having consciousness of it, while the appetite of the kidneys takes place without our perceiving it, so that when the affection reaches its height no such sensation as takes place in canine hunger has been produced. So it is natural that this appetence of the kidneys develops itself little by little, and that, in developing, there should be at first, without our feeling it, attraction of the serous liquid contained in the veins. Then, when everything has been drawn up and the blood appears entirely depleted of any such humidity, it is just as natural for the dried-out vessels to attract the humidity of the liver and

for the liver in turn to draw on the intestines and stomach. When the veins of the orifice of the stomach are dried out, one is taken with a strong desire for drink, since one is at that time feeling the diathesis. Then, once the liquid is taken in, the veins going from the liver to the stomach, since they are in a dry state, seize upon the liquid in its totality, and thence it passes through succeeding intermediaries until it reaches the kidneys. I have showed, indeed, in my treatise *On the Natural Faculties* (I, 10, 11; II, 7) that not only drink, but also solid food is carried to all parts of the body by virtue of a transmission following attraction. Therefore, with due consideration for the rapidity of the passage, diabetes resembles diarrhoea as much as any kidney trouble resembles stomach trouble. But these two affections differ by the fact that in diabetes all the work of transportation, before the liquid reaches the kidneys, is a succession of natural operations taking place because of the effect of an attractive faculty. Yet there is still another analogy between them. The attraction of the liquids of the vena cava to the kidneys is analogous to the first ingestion into the stomach of foods coming from the mouth; but the functions taking place before this are peculiar to diarrhoea of the urine.

Some physicians think, but without reason, that diabetes is an affection of the stomach like canine hunger. This error is made apparent by the consideration that those who fill their stomachs because of a violent thirst, keep the liquid for a long time. Indeed, one can take account of the four following symptoms when one has drunk to assuage a violent thirst:—the first is vomiting, the second is rapid evacuation through the intestine because of diarrhoea or lentergy; the third is a prolonged stay in the stomach; the fourth is precisely that about which we are now speaking, called “diabetes,” “intense thirst,” or “diarrhoea of the urine.” We do not give these names as fitting ones, but we attempt to find the path that happily leads to a cure, by means of the affected place and the diathesis itself.

There is another affection exactly like diabetes; it is manifest when abundant foods are neither badly digested, nor disposed of by the stools, do not give rise to a plethora, and are not nourishing, but are apparently promptly dissipated by perspiration. This affection is neither as rare, nor as rebellious as diabetes, for if diagnosed before it reaches the highest development it is not difficult to cure. When a person eats as much as double the usual amount,

and his body atrophies without diarrhoea, the illness of which we are speaking is easily recognized, not only by physicians, but even by the laity. If one goes as far as eating three times the amount, the treatment must be hastened before one reaches the stage of quadrupling or quintupling. It is rational enough to say that this illness comes from a rapid diaphoresis, while all the parts still keep their attractive faculty, as well as the one commonly called "appetitive." The first cause of violent thirst, not accompanied by diabetes, lies in the stomach, and especially in its orifice, since this organ is prey to a dyscrasy that is either hot or dry, or both at the same time. Along with the stomach this same condition holds in the liver, especially in its concave part, when the mesentery, the jejunum, the stomach itself, the esophagus, and the lung are taken by a burning heat at the same time as this concave part. The origin of this ardent thirst sometimes lies in the fact that these organs are burned by an erysipelatous condition, a state generally involving different types of marasmus, as I have said in my book treating of the subject (*On marasmus*, vide *Dissert. on pathol.*) Because of the similarity of the symptoms, I have mentioned this affection at the same time as that of the kidneys. Diabetes is an illness proper to the kidneys, analogous to canine hunger, which has its seat at the orifice of the stomach and is accompanied by atony of the retentive faculty. Indeed, if we say that diabetes exists without a violent appetite (for drink), then an unusual quantity of urine would not be produced in the kidneys, while without atony of the retentive faculty one would not notice a rapid urination.

PAUL OF ÆGINA

(625-690)

AFTER GALEN a long period ensued when medicine ceased to be a productive science, and the greatest men in its professional practice confined their writing in the subject to little more than copying the work of their predecessors. Among this group was PAUL, a native of the Greek island of Ægina, who published sometime during the seventh century an "Epitome" of existing medical knowledge. This was first printed in Venice in 1528, and has been translated into English, French and German. It furnishes a good light on the state of medical knowledge in the "Byzantine period," when for three centuries intellectual culture centered at the Greek capital of the eastern Roman empire. The selections below, while overrun with the current extravagant therapeutics, indicate the extent of knowledge on superficial pathological anatomy in this period, and at the same time exhibit the dominating influence of the ancient humoral pathology on etiological thought.¹

ON CARBUNCLE OR ANTHRAX

When the blood having become more melancholic than natural, ferments and fixes in a part, the diseases called carbuncles are formed, which are sloughy ulcers, for the most part beginning with bullae, like burnt parts, but sometimes without them; and the patients at first rub the part for its itchiness, whether one bulla is formed or several small ones, like millets, which, having burst, a sloughy ulcer takes place, resembling those occasioned by cauteries, the eschar being sometimes of a cineritious colour and sometimes black, along with its being fixed to the base, and in a certain manner nailed to it, and it spreads at the same time, the surrounding flesh is in a fiery state, black in the colour, and shining like bitumen and pitch. Such is the true black bile. But carbuncles that form in the flesh are speedily circumscribed; whereas those which take place in membranes or nerves remain long, and affect sympathetically the parts below, so as to give origin to erysipelatous inflam-

¹ From the *Seven Books of Paul of Ægina*, translated from the Greek by Francis Adams for the Sydenham Society, London, 1844.

mations. Not a few terminate in suppuration, and most cases are attended with fever.

Carbuncles also sometimes arise from epidemic causes. We must treat them, unless they are very small, by venesection, carrying evacuation as far as to occasion deliquium animi; and after venesection it will not be improper to make deep scarifications in the part, on account of the thickness of the humour. To the affected part we may apply such things as are moderately repellent and discutient, as the cataplasm of plantain and boiled lentil, receiving the tender part of bread baked in an earthen pan, neither very fine nor foul; and above the ulcer we must put some of the strong applications, such as those of Andron, of Polyides, and of Pasion, mixing them with must, until they are of the consistence of the sordes of oil in baths. And so also the dry Massaleotic powder, which may be diluted in like manner. And the root of dracunculus, or of birthwort, or the juice of laserwort, or the Cyrenaic juice may be properly rubbed in, each of these with vinegar. Cases of an erysipelatous nature may be anointed with the applications for erysipelas; but those parts which are suspected of being sympathetically affected are to be wrapped in unwashed wool, out of wine and oil. When the inflammation abates, we must apply to the carbuncles the cephalic cerates spread upon pledgets. That from herbs is an excellent one, and that from natron, and the dry application for spreading ulcers, separately and with rose-oil. When the hardness remains, we must use the one from apples ascribed to Serapion. But we must hasten the suppuration of the carbuncles as much as possible, by changing the cataplasms and medicines twice during the day, and once during the night. In order to root out the carbuncles, and free them from their attachments to the surrounding parts, having divided sour pomegranates, boil in vinegar, and when softened, triturate, put into a linen rag, and apply. When dried, let them be moistened with vinegar. The carbuncle is made to suppurate and burst, by the inner part of old walnuts, or even of that which is not old, and by the leaves and shoots of cypress, or by its young and tender balls (pilulae), with barley-flour; by raisins deprived of their stones; by dried figs boiled in wine; by the flowers of horned poppy; by the juice of laserwort, with rue and some honey; by liquid pitch with raisins and axunge.

An excellent application for carbuncles. Of litharge, lb. j; of old oil, lb. j; of arsenic, oz. j; boil the oil and litharge until they do not

stain, and taking them off the fire, add the arsenic, and then boil it until it becomes black, and having levigated it in a mortar, use upon pledgets.

For gangrene, old ulcers, those called chironia, strumous ulcers, and the gout: it is a most admirable application for carbuncle, particularly in the eyelids. Of opium of acacia, of toasted misy, of flakes of copper, or each, dr. ij; of copperas, dr. j; of the seed of henbane, dr. j; triturate in water, and use. They say also that the ointment called tetrapharmacon, having a fifth part of frankincense, is an excellent application. But for carbuncles in the pudenda, take of chalcitis, of copperas, or each, dr. viij; of aphronitrum, dr. ij; triturate with water, and use. Sheep's dung roasted with honey is also a good remedy. In Alexandria they use the green serapias, which is also called orchis and triorchis, with crumbs of bread, as a cataplasm for carbuncles and all sloughy ulcers; and when the eschar falls off, they cure them as a common ulcer.

ON CANCERS

Cancer occurs in every part of the body; for it takes place in the eyes and uterus (as we have stated when treating those parts), and in most other parts of the body; but it is more particularly frequent in the breasts of women, because owing to their laxity, they readily admit the thick humours which occasion it. For cancers are formed by black bile over-heated; and if particularly acrid, it is attended with ulceration. On this account, they are darker than phlegmons, without being attended with the same degree of heat. The veins are filled and stretched around like the feet of the animal called cancer (crab), and hence the disease has got its appellation. But some say that it is so called because it adheres to any part which it seizes upon in an obstinate manner like the crab. Owing to the thickness of the humour which occasions it, cancer is an incurable disease, for it can neither be repelled nor discussed; not yielding to purging of the whole body, resisting the milder applications, and being exasperated by the stronger ones. It may be possible, however, to prevent incipient cancers from increasing, by evacuating the melancholic humour before it becomes fixed in the part. We may evacuate, first, if nothing prohibit, by venesection, and afterwards by purging at the commencement, with the simpler purgatives, such as giving dodder of thyme to the amount of oz.

ivss; in whey or honied water, and afterwards hiera, containing the black hellebore.

ON APOPLEXY, AND HEMIPLEGIA OR PARALYSIS

When the common origin of the nerves is affected, and from it all the other parts of the body have lost their motion and sensibility, the affection is called apoplexy, by which the leading energies are impaired; but if the obstruction is in either side, it is called hemiplegia and paralysis; and if the injury is seated in any one part, it is called an affection of that part, and hence Hippocrates says, "His leg was seized with apoplexy."

Wherefore, in apoplectics, the respiration remains small. When, then, it is greatly perverted from its natural energy, it will induce a strong affection, and when but little, a weak one. Respiration is of the worst kind when it intermits, or is performed with great exertion. The affection arises suddenly from a cold phlegm obstructing the most important cavities of the brain. Whenever the whole origin of the spinal marrow is affected, all the parts below the face become paralysed, whilst it remains unaffected, because the parts there derive sensibility and motion from the brain; but, if one half only be affected, then is there a paraplegia of these parts, that is to say, a partial paralysis. If the sense of smell is affected, this arises from the anterior cavities of the brain having contracted the intemperament, or from the pores of the ethmoid bones being obstructed. Wherefore, apoplectics lie speechless, motionless, and insensible, without fever. The precursors of this affection are sudden and acute pain of the head, distension of the jugular veins, vertigo, flashes, as it were, of light in the eyes, an inordinate coldness of the extremities, palpitation and difficult motion of the whole body, and grinding of the teeth in sleep. Their urine is in small quantity, of a verdigris-green or a black colour, and containing a branny sediment. The affection occurs in old age to those of a phlegmatic temperament, and who use a diet of this nature. If it occur in youth and in the season of summer, it indicates a strong exciting cause.

* * *

On paralysis in particular parts. Paralysis occasioned by the division of a nerve is incurable; but when occasioned by an intemperament, or a certain humour, it is relieved by the common remedies already mentioned; but there are certain particular remedies

applicable to each of them which we shall describe below. Wherefore, in cynic spasms, the jaw is to be reduced to the opposite side by means of a muzzle. Detraction of blood from the vessels below the tongue will likewise be proper, as also cupping-instruments applied along the first vertebra, with masticatories, and purgatives administered by an instrument inserted into the nose. It is necessary to know that the jaw which appears to be distorted is not the one which is paralysed, but the opposite one. When the organ of deglutition is paralysed, cupping-instruments must be applied to the chin, and we must use the liniments made of castor, sagapene, and the Parthic juice. Acrid gargles are also beneficial. When the tongue is paralysed, we must open its veins, apply a cupping-instrument to the chin, and use masticatories of mustard, and exercise the tongue. When the organs of speech are paralysed, apply the remedies to the chest, enjoin retention of the breath, and have recourse to vociferation. When the eyebrows are affected, anointing of the eyelids in like manner is of great use, and, at last, the operation by suture called anarrhaphé. When the bladder is paralysed, there is either retention of urine or an involuntary discharge of it. The remedies are to be applied to the bottom of the belly and perinaeum, and clysters injected by the anus, consisting of oil of rue, or Sicyonian oil, with butter and castor, galbanum, opopanax, or the juice of laserwort. And these things if injected into the bladder by the penis, will be of great service, or prove sufficient of themselves. Clysters of centaury and colocynth, along with Sicyonian oil, are also beneficial; and diuretics may be drunk with advantage, and castor taken in like manner. But, above all things, we must have recourse to the catheter when the patients cannot make water, and get them to sit in hot baths of a relaxing nature, and use emollient cataplasms. When the urine flows involuntarily, we must treat them upon the astringent plan with tonic remedies, and make them use dry food and cold drink. During convalescence they ought to use rubefacients, and natural baths in a cold state. Cases occurring from a wound of the spine, from a fall and dislocation of a vertebra, if there be a concurrence of fatal symptoms, it is impossible to remedy. If the penis is paralysed, we must apply the remedies recommended for the bladder to the same parts, and also to the groin; and medicines which excite to erections ought also to be used. Milk, cheese, and the other cakes are improper, likewise lettuces and the other pot-herbs. When the rectum is paralyzed,

in which case the faeces are either discharged involuntarily, or retained, the same remedies must be used, and clysters are to be administered, sometimes of an astringent nature, such as the decoction of cypress, of rush, or of bramble; and sometimes emollient, such as the fat of swine and geese, and the oil of mallows; and sometimes stimulating, such as salt water, the decoction of colocynth, or the like. Nothing contributes so much to motion as variety of exercise with the lever. If they complain of a sense of cold, the restorative plaster of euphorbium, dissolved in oil, may be used for a clyster. But, along with the ordinary treatment, the paralysed limbs should be bent, rubbed, and stretched in the manner described; for our greatest dependence is upon friction.

ON EMPYEMA AND PHTHISIS

Empyema is formed either in the cavities of the chest, or in the pleura, sometimes arising from vomiting of blood, when the ulcer has not healed (in which case phthisis soon comes on, provided the discharge came from the lungs), and sometimes from a precursory inflammation, which has formed into an abscess and burst (as is sometimes the case in pleurisy), or from a defluxion from the head. The symptoms of a confirmed empyema are weight in the chest, an intense dry cough, with pain, and sometimes with a fluid, in which case they seem to experience an alleviation. At the commencement the attacks of fever are weak, irregular, and difficult to perceive; but when the abscess is about to burst, they have more violent fever, attended with rigor, and in speaking their breathing is obstructed. When the abscess bursts, matter is brought up, sometimes pure and sometimes feculent: sometimes it is discharged upwards, when it is attended with more danger; and sometimes downwards, in which case the matter is partly translated to the stomach and bowels; and partly to the bladder, the metastasis taking place by certain vessels. All along they have hectic fever until the ulcer becomes clean; and if this do not speedily take place, the empyema is converted into phthisis from the lungs undergoing ulceration. When this takes place, the cheeks are livid; there are copious sweats about the forehead and neck; the flesh is melted, the nails bent, and they appear glossy, white, or pale. When the disease gains ground, the bowels become loose, the hypochondria are retracted; for the most part thirst and a loathing of food oppress them; and the expectoration is very fetid.

R H A Z E S

(860-932)

THE LIFE of Abú Mohammed Ibn Zacaríyá Ar-Razi or RHAZES, a Persian of the period of Islamic domination of medicine, carries the full flavor of the Arabian Nights. A musician by original training he later chose medicine as a profession, and in a restless life said to have closed with the statement, "I have seen so much of the world that I am weary of it," he wandered throughout Mohammedan lands from Bagdad to Cordova, acquiring all the medical lore of the time and perpetuating much of it in his own writings. A large part of this was mere copying from older writers, the Arabic physicians having little gift for research as we think of it today. But in the field of the eruptive fevers their observations were original, and credit for their first extended consideration in writing goes to Rhazes. A selection from his "Treatise on Smallpox and Measles," is here presented.¹

THE CAUSES OF SMALL-POX

In the name of GOD, the Compassionate, the Merciful.

Abú Becr Mohammed Ibn Zacaríyá says:—It happened on a certain night at a meeting in the house of a nobleman, of great goodness and excellence, and very anxious for the explanation and facilitating of useful sciences for the good of mankind, that, mention having been made of the Small-Pox, I then spoke what came into my mind on that subject. Whereupon our host (may GOD favour men by prolonging the remainder of his life,) wished me to compose a suitable, solid, and complete discourse on this disease, because there has not appeared up to this present time either among the ancients or the moderns an accurate and satisfactory account of it. And therefore I composed this discourse, hoping to receive my reward from the Almighty and Glorious GOD, and awaiting His good pleasure.

¹ Translation from the original Arabic by William Alexander Greenhill for the publications of the Sydenham Society, 1848.

CHAPTER I

Of the causes of the Small-Pox; how it comes to pass that hardly any one escapes the disease; and the sum of what Galen says concerning it.

As to any physician who says that the excellent Galen has made no mention of the Small-Pox, and was entirely ignorant of this disease, surely he must be one of those who have either never read his works at all, or who have passed over them very cursorily. For Galen describes a plaster in the first book of his treatise *κατὰ γένος*, and says that it is useful against this and that disease, "and also against the *Small-Pox*." Again, in the beginning of the fourteenth book of his treatise "On Pulses," at about the first leaf, he says, that "the blood is sometimes putrefied in an extraordinary degree, and that the excess of inflammation runs so high that the skin is burned, and there break out in it the *Small-Pox* and excoriating erysipelas by which it is eroded." Again, in the ninth book of his treatise "On the Use of the Members," he says that "the superfluous parts of the food that remain, which are not converted into blood, and remain in the members, putrefy, and become more acid, in process of time, until there are generated the erysipelas, *Small-Pox*, and spreading inflammation." Again, in the fourth book of "Timaeus" he says that "ancients applied the name *φλεγμονή* to every thing in which there was inflammation, as the erysipelas, and *Small-Pox*, and that these diseases were in their opinion generated from bile."

(2) If, however, any one says that Galen has not mentioned any peculiar and satisfactory mode of treatment for this disease, nor any complete cause, he is certainly correct; for, unless he has done so in some of his works which have not been published in Arabic, he has made no further mention of it than what we have just cited. As for my own part, I have most carefully inquired of those who use both the Syriac and Greek languages, and have asked them about this matter; but there was not one of them who could add anything to what I have mentioned; and indeed most of them did not know what he meant by those passages which I have distinctly quoted. This I was much surprised at, and also how it was that Galen passed over this disease which occurs so frequently and requires such careful treatment, when he is so eager in finding out the causes and treatment of other maladies.

(3) As to the moderns, although they have certainly made some

mention of the treatment of the Small-Pox, (but without much accuracy and distinctness,) yet there is not one of them who has mentioned the cause of the existence of the disease, and how it comes to pass that hardly any one escapes it, or who has disposed the modes of treatment in their right places. And for this reason we hope that the reward of that man who encouraged us to compose this treatise, and also our own, will be doubled, since we have mentioned whatever is necessary for the treatment of this disease, and have arranged and carefully disposed every thing in its right place, by GOD's permission.

(4) We will now begin therefore by mentioning the efficient cause of this distemper, and why hardly any one escapes it; and then we will treat of the other things that relate to it, section by section: and we will (with GOD's assistance,) speak on every one of these points with what we consider to be sufficient copiousness.

(5) I say then that every man, from the time of his birth till he arrives at old age, is continually tending to dryness; and for this reason the blood of children and infants is much moister than the blood of young men, and still more so than that of old men. And besides this it is much hotter; as Galen testifies in his Commentary on the "Aphorisms," in which he says that "the heat of children is greater in quantity than the heat of young men, and the heat of young men is more intense in quality." And this also is evident from the force with which the natural processes, such as digestion and growth of body, are carried on in children. For this reason the blood of infants and children may be compared to must, in which the coction leading to perfect ripeness has not yet begun, nor the movement towards fermentation taken place; the blood of young men may be compared to must, which has already fermented and made a hissing noise, and has thrown out abundant vapours and its superfluous parts, like wine which is now still and quiet and arrived at its full strength; and as to the blood of old men, it may be compared to wine which has now lost its strength and is beginning to grow vapid and sour.

(6) Now the Small-Pox arises when the blood putrefies and ferments, so that the superfluous vapours are thrown out of it, and it is changed from the blood of infants, which is like must, into the blood of young men, which is like wine perfectly ripened: and the Small-Pox itself may be compared to the fermentation and the hissing noise which take place in must at that time. And this is the rea-

son why children, especially males, rarely escape being seized with this disease, because it is impossible to prevent the blood's changing from this state into its second state, just as it is impossible to prevent must (whose nature it is to make a hissing noise and to ferment,) from changing into the state which happens to it after its making a hissing noise and its fermentation. And the temperament of an infant or child is seldom such that it is possible for its blood to be changed from the first state into the second by little and little, and orderly, and slowly, so that this fermentation and hissing noise should not show itself in the blood; for a temperament, to change thus gradually, should be cold and dry; whereas that of children is just the contrary, as is also their diet, seeing that the food of infants consists of milk; and as for children, although their food does not consist of milk, yet it is nearer to it than is that of other ages; there is also a greater mixture in their food, and more movement after it; for which reason it is seldom that a child escapes this disease. Then afterwards alterations take place in their condition according to their temperaments, regimen, and natural disposition, the air that surrounds them, and the state of the vascular system both as to quantity and quality, for in some individuals the blood flows quickly, in others slowly, in some it is abundant, in others deficient, in some it is very bad in quality, in others less deteriorated.

(7) As to young men, whereas their blood is already passed into the second state, its maturation is established, and the superfluous particles of moisture which necessarily cause putrefaction are now exhaled; hence it follows that this disease only happens to a few individuals among them, that is, to those whose vascular system abounds with too much moisture, or is corrupt in quality with a violent inflammation; or who in their childhood have had the Chicken-Pox, whereby the transition of the blood from the first into the second state has not been perfected. It takes place also in those who have a slight heat, or whose moisture is not copious; and to those who had the Chicken-Pox in their childhood, and are of a dry, lean habit of body, with slight and gentle heat; and who when they became young men, used a diet to strengthen and fatten their body, or a diet which corrupted their blood.

(8) And as for old men, the Small-Pox seldom happens to them, except in pestilential, putrid, and malignant constitutions of the air, in which this disease is chiefly prevalent. For a putrid air, which has an undue proportion of heat and moisture, and also an inflamed

air, promotes the eruption of this disease, by converting the spirit in the two ventricles of the heart to its own temperament, and then by means of the heart converting the whole of the blood in the arteries into a state of corruption like itself.

(9) Having thus sufficiently, though briefly and succinctly, treated of the causes of the Small-Pox, we shall now proceed to speak of the habits of body which are most disposed to this disease and to the Measles.

CHAPTER II

A specification of those habits of body which are most disposed to the Small-Pox; and of the seasons in which these habits of body mostly abound.

The bodies most disposed to the Small-Pox are in general such as are moist, pale, and fleshy; the well-coloured also, and ruddy, as likewise the swarthy when they are loaded with flesh; those who are frequently attacked by acute and continued fevers, bleeding at the nose, inflammation of the eyes, and white and red pustules, and vesicles; those that are very fond of sweet things, especially, dates, honey, figs, and grapes, and all those kinds of sweets in which there is a thick and dense substance, as thick gruel, and honey-cakes, or a great quantity of wine and milk.

(2) Bodies that are lean, bilious, hot, and dry, are more disposed to the Measles than to the Small-Pox; and if they are seized with the Small-Pox, the pustules are necessarily either few in number, distinct, and favorable, or, on the contrary, very bad, numerous, sterile, and dry, with putrefaction, and no maturation.

(3) Lastly, those bodies that are lean and dry, and of a cold temperament, are neither disposed to the Small-Pox nor to the Measles; and if they are seized with the Small-Pox, the pustules are few, favorable, moderate, mild, without danger, and with a moderate light fever from first to last, because such constitutions extinguish the disease.

(4) I am now to mention the seasons of the year in which the Small-Pox is most prevalent; which are, the latter end of the autumn, and the beginning of the spring; and when in the summer there are great and frequent rains with continued south winds, and when the winter is warm, and the winds southerly.

(5) When the summer is excessively hot and dry, and the autumn

is also hot and dry, and the rains come on very late, then the Measles quickly seize those who are disposed to them; that is, those who are of a hot, lean, and bilious habit of body.

(6) But all these things admit of great difference by reason of the diversity of countries and dwellings, and occult dispositions in the air, which necessarily cause these diseases, and predispose bodies to them; so that they happen in other seasons besides these. And therefore it is necessary to use great diligence in the preservation from them, as soon as you see them begin to prevail among the people; as I shall mention in the sequel.

WILLIAM OF SALICETO

(ABOUT 1201-1280)

ONE OF the great figures of medieval medicine was WILLIAM of SALICETO, who was for a time professor at Bologna and a leader in the rise of north Italian medical science. Although he is best known as a surgeon, his treatise on internal medicine, entitled "*Summa Conservationis et Curationis*," a work of still undetermined date, was a noteworthy production. It is based largely on the Arabic writings, but contains good original case reports. Frequent reference has been made in medical history to its consideration of diseases of the kidney. The study of Saliceto's work and careful revision of faulty texts has been much stimulated by Julius Pagel, whose pupils have reprinted certain selections with critical analyses of their content. The selection here reproduced is that part having to do with renal abnormality.¹

DISEASES OF THE KIDNEYS

Chapter 138. The signs of a stone in the kidney are colic-like pains resulting from its constringing effect. The afflicted suffers from nausea and fainting spells and feels a pain in the flanks. It is necessary to distinguish between pain in the flanks due to stone in the kidneys and that made by the urine in colic. When there is sand in the urine, or the sufferer voids sand or stones subsequent to such a pain, or has voided for some months before it a black urine, with which was associated a pain or turbulence in the kidneys, then in truth a stone is present. But if none of these signs occurs, then pain after extreme nausea is an indication of colic, and although much nausea precedes a stone it is greater with colic. Moreover in colic the region of pain in the abdomen is more extensive and tends toward the anterior parts, while in the case of stone its extent is less and it tends to affect the posterior parts. Again the pain of colic fluctuates, while that truly from the kidneys does not. Likewise an indication of stone in the kidneys is pain therein and about, both in the loins and in the emonctories, with heaviness and retention as if something were suspended in them.

¹ Translated by the editor from the Latin of the *Summa Conservationis* as reproduced by E. Loewy from Pagel's improved text.

Chapter 139. The signs of an abscess in the kidneys are a fever at the outset without a manifest paroxysm with retention and rigor. In addition the sufferer feels a weight in the kidneys or back when he lies prone, the passage of urine is impeded, and after a time a prominence appears in the region of the liver.

Chapter 140. The signs of induration of the kidneys are a lessening of the quantity of urine and a heaviness of the kidneys with a certain pain in the back. After a time the abdomen begins to be distended and later becomes dropsical. Usually an induration of this kind occurs subsequent to a hot abscess in the kidneys and the fever caused thereby.

Chapter 145. The signs of thinness or meagerness of the kidneys are a moderate pain in the back and thinness of the body with loss of desire for coitus, a quantity of urine and a whiteness thereof.

Chapter 148. And for these reasons physicians would have it that a stone is never formed in the bladder of women, or only rarely so and then is never so large as in boys or men. From what has been said there is plainly a cause of generation of stones in the kidneys of old men and bladders of boys but not of girls.

ANTONIO BENIVIENTI

(ABOUT 1440-1502)

IN THE second half of the fifteenth century ANTONIO BENIVIENTI, who has come down to us simply as a "physician and philosopher," practiced medicine in Florence. Few details of his life have survived, and we have no reason to feel certain that his standing was exceptional among the physicians of his day. We do know, however, that he possessed in high degree that spirit of eager inquiry characteristic of the early Renaissance and added to this an analytic orderliness of mind, which as it turned out preserved his name for posterity. For at his death in 1502 he left on file accurate, if short, notes on the more interesting and instructive cases of his practice, which his brother Ferome Benivieni could easily publish without essential change as a book from the hand of the Florentine physician. This work, which appeared in 1507 under the title "*De Abditis non nullis ac Mirandis Morborum et Sanationum Causis*," throws a clear light on the manner of medical practice of the day, and shows that it had already become common for physicians to request of the patient's relatives permission to perform a necropsy in obscure cases where the diagnosis during life had been uncertain. In the one hundred and eleven short chapters of this fascinating work a score of post-mortem examinations are recorded. While these leave much to be desired in comparison with modern records and indicate some curious notions on anatomy (as of the gall bladder), they show clearly that these Florentine physicians were as well aware as we of the means by which scientific medicine is to be furthered. Four chapters from this book on "The Hidden Causes of Disease" are reproduced here as representative of the series.¹

CHAPTER III

ON STONES FOUND IN THE TUNIC OF THE LIVER

A noble woman suffered for a long time from a pain arising in the region of the liver, and on account of it consulted a great many physicians, but was unable to escape the malady by the use of any remedy, wherefore she resolved to try our skill along with others.

¹ Translations by the editor.

uix pellis & ossa superessent / gradatim tandem ad mortem deductus est. Quare defuncti cadauere publicæ utilitatis gratia inciso inuentum est hominis uentriculus ita iunctis oris ad imam eius partem obcalluisse / ut cum nihil inde ad inferiora transmittere potuerit, necessario mors subsecuta sit.

Callus in uenis mesaraicis. XXXVII.

p Etrus Aldimarius filium habuit: qui cum octauum iam ageret annum / in corruptum incidit appetitum; quo calculos ruderæ comedens in lentam tandem fæbriculam deuenit. Indeque procedente tempore & uentriculus non continere & ueter fluere cœpit. Adeoque duobus his malis vexatus est puer / ut paucis etiam diebus uita decesserit. Huius nos cum annuente patre emortuum corpus incidissemus / reperi tus est callus inter uenas / quas mesaraicas appellant: a quo cum uenæ ipsæ adeo obstruerentur omnes / ut ferri inde sanguis ultra nō posset / necesse fuit puer e uita migrare.

Angina incisa. XXXVIII.

a Angina laborabat Nicolaus Rota: sed null⁹ tñ rubor aut tumor uel intus in gula uel extra uidebatur. Et ipse nihilominus

We came together, many physicians, and discussed from this time on in many a conversation what might be the hidden causes of this disease. In truth we did not agree so that a decision could be reached in the midst of our many doubts. While some judged that an abscess of the liver might be present, and others an ill habit, we ourselves believed the fault lay in the covering membrane of the organ. And when, after a few days, with increasing severity of the disease she passed away, even as we had by common consent predicted from certain signs, we took care that the body of the deceased should be opened. And we found, packed in the sloping portion of the covering of the liver, stones of varying size and color. Some were round, some angular, and some quadrate, according as situation and chance determined. These by their own weight made from the tunic of the organ a small sac as long as the palm of the hand and broad as two fingers. After observing this cause of death we judged it idle and without profit to dispute further on the obscurities.

CHAPTER XXXVI

CALLOUS GROWTH IN THE STOMACH

Antonius Brunus, a relative of mine by marriage, could retain the food he had eaten but a short time, and then vomited it back, undigested, quite as it was. He was assiduously supported by all the medicaments that can be applied for ailments of the stomach, but these helped in no way. From lack of nourishment of the body he wasted away until scarcely skin and bone remained, and finally little by little was brought to the end. In the interest of the public good the defunct body was then opened. The stomach was found grown into a callus at the lowest part of its orifice, so that nothing could be passed through to the parts below. Inevitably death resulted.

CHAPTER XXXVII

CALLUS IN THE MESARAIC VEINS

The son of Peter Aldimarius in his eighth year developed a perverted appetite, eating stones and plaster until he finally reached a state of lingering mild fever. With the passage of time the stomach began to fail to retain food and the bowels became loose. With these two ailments the boy was in such distress that within a short time he died. With the consent of the father we opened the corpse and

found a callous substance among those veins which are called the mesaraic. As a result of this, with all the veins obstructed so that the blood could not be carried further, inevitably the boy departed from this life.

CHAPTER LXI

DEATH FROM DIFFICULTY IN BREATHING

We have known many who suffered from difficulty in breathing. Among others was one who supported existence only by holding his neck continually erect, while gradually, with failing strength, becoming pale and cyanotic throughout his body. Yet there was no pain in the chest or praecordium. On the other hand a whistling sound was to be observed, the result of the difficulty with which the breath was exhaled. From this one could conclude that he suffered from an ailment of the chest. After some days, with increasing severity of the affliction, remedies failing, the sick man passed away. We decided then to open the body, so that we might apprehend the hidden and unknown causes of his illness. When this was done we found enough black bile and blacker blood had come together in his heart, so that it is no wonder that the mixture on diffusing through the veins corrupted the breath itself and brought the man to a hurried end. As we know, such a fact was touched upon elsewhere by the author Galen.

GIROLAMO FRACASTORO

(1484-1553)

ONE OF the most engaging figures of the Italian medical Renaissance is the Veronese philosopher and poet GIROLAMO FRACASTORO. He was well versed in astronomy, geology and general natural science, as well as medicine. His lasting reputation in the latter field rests largely upon his descriptions of syphilis and his views on the nature of contagion, which in some respects were almost modern. He wrote two treatises on syphilis, one in a lighter vein, viz., a poem entitled "*Syphilis sive Morbus Gallicus*" (1530), and a more serious and extensive prose study in his great work on contagion (1546). This venereal disease had become the outstanding pestilence of the period. After a brief period of perplexity, during which the nations of the world pointed the finger of reproach at each other, a speedy general concord was reached on the term "*morbus Gallicus*" or "French disease." The modern designation dates from the poem of Fracastoro, who cast in an heroic mold the misadventures of a shepherd by the name of Syphilus, who was disciplined with the disease for blaspheming the Sun God. The first of the following passages is from this poem.¹ The other selection is the section on syphilis in his work "*De Contagionibus, Morbisque Contagiosis et eorum Curatione*" (1546).¹ It is especially interesting for the view it gives of the astrological concepts of the period.

SYPHILIS OR THE MORBUS GALLICUS

(THE POEM, 1530)

Inasmuch as contagion is so varied in nature and kind, and the seeds are so many and in such strange forms, let us consider this one whose origin is from the sky and which, seemingly defunct, broke out so marvellously into the air.

This disease did not infect the voiceless denizens of the sea, the natant throng, not the birds, not the brutes wandering in deep woods, not the droves of cattle, or the herds or the horses—but only one kind out of all living creatures, humankind, the one with active mind; and it ate itself deep within our members. Further, out of

¹ From the translations by William Renwick Riddell, Toronto, 1928.

the whole man, what was crass in the blood itself and foul with lentor, this vilest of diseases seized on first, feeding itself on the pinguid moisture—that was the way with the disease and the blood.

Now, I shall explain all the effects and the symptoms of this wretched contagion; and would that the Muse might be able to grant so much, Apollo might be willing to avert so much—Apollo, who unfolds long ages and to whom poesy is dear—that these our labours may survive many days! Perchance it may even help our descendants, hereafter, to read these symptoms and to recognize the appearance of this plague.

For, again, when the Fates so decree, after gliding years, the time will be when it will lie asleep buried in black night; and then, after long ages, the very same will rise again and revisit the skies and air once again, a coming age will marvel at it.

In the first periods, this fact was strange—that after contagion, frequently the moon became full four times before the symptoms were sufficiently developed. I mean it did not show itself openly at once and as soon as it was received within, but it lay hidden for a certain time and by degrees acquired strength by what it fed on. In the meantime, weighed down by unaccustomed malaise and giving way to torpor, those infected discharged their duties too languidly and moved sluggishly with the whole body. The very sparkle faded from the eyes and the colour expelled from the face left the countenance dejected. Little by little was produced on the polluted pudenda a caries, and, this, unconquered, eroded the parts here and there and the thigh—then the symptoms of the evil showed themselves more openly, for when the benign light of the pure day ceased in its flight and brought in the gloomy shades of night the native heat accustomed to seek the inward parts at night left the outer body so as no longer to warm the members weighted with the weary load of the humours, and then the joints, the arms, the shoulders, the calves, were racked with severe pains.

Then, where the contagion ran through every vein and the very humours, and polluted what was to be its food, Nature, wont to excrete an ill, drove the infected part outward from the whole body—but in truth, as this was slow from its crass substance and viscous from lentor, much in its progress adhered to the bloodless members and arms—there spreading, it produced extreme pain in the joints; with its lighter part that is by nature more prone to break out, it sought the outer stricken surface of the skin and the extremities of



PLATE 3. GIROLAMO FRACASTORO (1484-1553)

the members. At once, disfiguring eruptions broke out over the whole body and made the face a thing of horror and the breast repulsive—a new form of disease—pustules like acorns and rotten with pinguid phlegm. These, no long time after, gaping wide-open, flowed copiously with mucous sanies and corruption. Sometimes, too, eating deep and burying itself within, it eroded the body pitifully—for often we saw the joints denuded of their flesh and bones, growing squalid, the face eaten away gape with hideous opening, the lips and throat giving forth but feeble sounds.

As you have often seen on cherries or the sad tree of Phyllis, a pinguid fluid drip from the moist bark and shortly after harden into the stiffness of gum—no different is this mucor accustomed to flow through the diseased body—and then at length to harden into vile callus.

Therefore, one sighing over the spring of life and beauteous youth and gazing with wild eyes on his deformed members, his foul joints and turgent lips, in his misery oft called the gods, oft the stars, cruel.

While all the weary beasts throughout the world were enjoying sweet dreams and the sleep of night, no rest came to them, all sleep fled them into the air, for them rising Aurora reddened unwelcome, for them the day was hateful, hateful the image of night—no Ceres, no gift of Bacchus delighted them—not delicate banquets or abundance of things, not wealth in city or country or any other joy—though oftentimes they sought the shining streams and jocund Tempe and the quiet airs on mountain tops. To the gods were lavished prayers, in the temples incense burned and the altars were decorated with costly gifts—the gods were deaf to every prayer and moved by no gift.

* * *

The story goes that Syphilus, a shepherd, was feeding, by these streams, a thousand cattle and a thousand snowy sheep for the table of the King Alcithous: it chanced that the Dog-star was in the very solstice burning the thirsty fields; he was burning the groves, and the woods offered no shade to the shepherds; the air gave no relief—the shepherd pitying his flock and irritated by the burning heat, raising his face to the lofty Sun and his rays, cries: “Now, why do we call you, O Sun, the father of things and god? and, a foolish people, why do we erect sacred altars and venerate you with bull slain and rich incense when you have no care for us nor do the sufferings

of the royal herds touch you? It seems to me that you gods are rather burning with envy: with me are feeding a thousand heifers of the colour of snow, a thousand sheep—you have hardly a single Bull, hardly a single Ram in the heavens (if they say true), and one measly Dog is the guardian of such a herd! Fool that I am! I should rather pay divine honours to the King to whom so many fields, so many people, so broad a sea, minister—and whose might is greater than gods or Sun: he will give cool breezes and bring the grateful chill of living trees to the flocks and he will alleviate the heat.”

So saying—no delay—he set up a sacred altar and offered divine honours to King Alcithous in the mountains. Him, a member of the countrymen, him, another crowd of shepherds follow—they give incense to the altar-fires, they sacrifice with the blood of bulls, and the smoking viscera stream.

When afterwards, the King seated on the throne and his subject peoples and flattering crowd heard this, rejoicing in divine honour given him, he ordered that no other deity should be worshipped on earth, under penalty of his vengeance, that no one should be held greater than himself in his land—that the gods inhabited the sky, but what was below did not belong to them.

This, he saw who sees everything, who watches everything, the Sun, the Father—and, raging inwardly, he twisted his rays so as to be harmful and shone with a malign light. On this occurring, Mother Earth and the waters of the sea were affected and the air became heated by the force: at once, an unknown foulness arises in the blasphemous land. First of all, Syphilus who has instituted divine honours to the King and set up an altar in the mountains, shows foul pustules over his body, he first experiences sleepless nights and convulsed members—and from the first to be attacked, the disease drew its name, Syphilis, which the country folk called it after him—and now the evil plague was diffused generally through all the cities, nor did the dire disease spare the King himself.

SYPHILIS OR THE MORBUS GALLICUS

(PROSE, 1546)

Now let us pass to those contagions which chiefly attack the exterior, beginning with the disease Syphilis.

In truth among other marvels, our time has witnessed a new

disease long unknown to our hemisphere, which has filled almost all Europe and no small part of Asia and Africa. It invaded Italy, in fact, about the time the French under King Charles occupied the Kingdom of Naples about ten years before 1500, from whom the name was given to the disease, Gallicus: the French, however, retaliate on us by calling the disease, Italian: the Spaniards call it, Patura: the Germans sometimes Mevius, sometimes Gallicus—some, imposing a new name, call it Pudendagra, which is derived from Pudenda in the same way as Mentagra, which is derived from Mentum (the chin) and of which Pliny writes that it was a new disease so named by the ancients—we [i.e., Fracastorius] in our lighter works called it Syphilis.

This disease, heretofore unknown in our hemisphere, they say is very common in certain regions which the Spanish navigators discovered—a new world where that contagion abounded to the widest extent, and was as well known a disease as Scabies is with us.

When it appeared first among us, the following characteristics were conspicuous—in some, it appeared without any contagion contracted; in some (and they were the greater number) it was caught by contagion; not, it is true, by everyone, nor at once, but only when two bodies became heated by mutual contact, generally in coitus, in which way most were infected. Still, a few infants were seen who were infected by sucking from the mother or nurse. This disease does not leave a “Fomes,” or at least only in very serious cases; nor does it propagate itself to a distance; and, again, it does not manifest itself immediately, but it lies dormant for a certain time, sometimes for a month, often for two months.

In the meantime, however, there are symptoms of the disease having been caught—a certain melancholy in the mind, lassitude in the body and facial pallor, and, what is seen in most cases, certain small ulcers formed around the pudenda, not dissimilar in appearance to those which are wont to arise from fatigue, which they call “Caries,” but very different in nature—for the former are persistent, and on being subdued in one part, regerminate in another with perpetual self-propagation. After these, certain crustose pustules break out, in some cases the greater number beginning on the scalp, in others on other parts; these at first appear small, then gradually they grow to the size of an acorn cup, and not dissimilar to those in boys, which are called “Achores.” There is a great variety in these; in some they are small and drier, in others larger

and more fatty—in some growing livid, in others slightly whitish, in others again harder and reddish—all, however, after a few days open and drip a certain fetid, mucilaginous mucus; and it passes all saying what a quantity of this mucus constantly flows and what *sordities* appears. Then they begin to exulcerate by corrosion, like those ulcers which are called phagedenic, and sometimes attack not only the flesh but even the bones themselves.

In those in whom the disease attacks the upper parts, foul drippings appear which in some eat away the palate, in some the uvula, in some the fauces, and in some the tonsils—in some the lips are consumed, in some the nose, in some the eyes, and in some the whole pudenda. Moreover, for the most part, large gummosities appear in the members, making a great deformity, for often they equal in size an egg, or even a loaf, in which when opened there is apparent a white mucilaginous mucus—this tenacious *callus* occurs chiefly in the arms and thighs, which sometimes ulcerate and sometimes continue thus till death.

In addition to all these—as though they were of little moment—severe pains attack the arms, often accompanying these pustules, sometimes before, sometimes after—and they of long duration (and nothing can be more severe) afflict the patient chiefly at night; the pain is not, properly speaking, in the joints, but around the arms and the nerves.

Nevertheless, it is true, pustules sometimes appear without pain, and sometimes pain without pustules, but in most cases both afflictions are present.

In the meantime, all the members are languid, the body is emaciated, there is no desire for food, no sleep, but melancholy, continued irascibility and desire to lie down, while the face and the thighs swell—sometimes a sort of low fever accompanies, but rarely—in some cases there is headache; this pain is persistent and yields to no medicine. If blood be drawn, it is seen to be turbid and mucous, the urine too is thick, oily, sedimentary and reddish, by which symptoms alone in the absence of fever we have diagnosed many to have been attacked by this disease. The faeces are difficult and mucous and dry—by these symptoms, those who were suffering from the disease were known.

We here speak of the afflicted in the past tense, because although this contagion is still in full vigour, still, after the first period, it seems changed; for, beginning about twenty years ago, the pustules ap-

peared fewer, the gummosities more in number than they had been in the first years; then, too, the pustules, if any did appear, were drier, and the pains, if any did occur, were sharper in every patient. Later, the years passing by, about six years before the present time, there was again a great change in this disease—in very few indeed, do pustules now appear, and almost no pains at all, or much less severe; the gummosities are, it is true, many, and—what seems marvelous to everybody—the falling of the hair of the head and elsewhere makes men almost ridiculous, some coming to view without beard, some without eyebrows, some with a shining pate. This misfortune was at first thought due to the medicines, particularly mercury; but later, everyone, becoming better informed, knew that it came from the disease itself thus changed—and what is worst of all, now in many cases the teeth become loose, and in some cases even fall out.

THE CAUSES

When this new disease appeared for the first time, at once a great controversy arose among medical men, some contending that there was no mention of it by the ancients, others on the contrary contending that there was; some of these thinking it was Elephantiasis, others what was called by the Arabs, Safati, by others Lichenas. The first to solve the difficulty was Nicholas Leonicensus, a man most profoundly learned and of great weight, who clearly showed that it was none of these, but that the disease had not been mentioned among the ancients: Although, indeed, some later writers, rather obstinately than reasonably, disagreed with so great an authority and asserted it to be simply Elephantiasis—of which we shall say something a little later.

Moreover, of those who have so far treated of the disease, some seem to say rather what it is not, than what it is; others seem to have investigated rather the rationale which is concerned with the form, what the disease might be in composition, in combination and alone, while they left untouched the *materia* and *principia*—others, indeed, touched on the *materia*, the *principia*, too, and the rationale, but did not pursue the subjects as they should.

We, indeed, in those lighter works, which we dedicated to Pietro Bembo, now Cardinal, when by chance driven to the country by pestilence, we had much leisure, wrote concerning all these as specifically as the poetic art would admit—as that art did not

permit everything; but it was necessary for us to omit a good deal which we consider would be worth while if now pursued.

So far, then, as pertains to the first origin of the disease, some have thought that it was brought to us from the New World which the Spanish navigators reached, where this affection is very prevalent; as proof of this, they advance this, that the disease first appeared amongst us when that navigation was effected and intercourse had with that people, and then it was first seen among the Spaniards; consequently, they consider the infection to consist in contagion from one to another.

But, in fact, even although the greater number of mortals have contracted this disease by contagion, yet innumerable others have been observed to have become affected without contagion and per se.

Moreover, it would be impossible in so short a time for a contagion which is so sluggish in its nature, and is not readily caught, to have traversed so much territory if first introduced among the Spaniards by one ship—since it is established that it was seen at the same time, or about the same time, in Spain and France and Italy and Germany and almost all Scythia.

Add to this that, certain years before, astronomers had predicted it, and it is no small indication that the origin of it lay elsewhere than simply contagion. Now, it should not seem strange that new and unaccustomed diseases should appear at certain times, not being brought from one region to another, but arising from their own causes—in the year 1482, a certain kind of pleuritis broke out which affected nearly all Italy; and in our own times appeared what had never before been seen, Fevers which they call *Lenticulae*, concerning which we have treated in the Text above; and some years before, we saw also a contagious *Lippitudo* invade some cities. Moreover, we saw the plague commonly afflicting cattle alone which we spoke of above.

Consequently, it should not be wondered at if this *Morbus Gallicus*, which had not been known in our hemisphere for many centuries, should now break out; other new and unaccustomed diseases have come, brought in by time, such as *Mentagra* among the ancients, which not long afterwards disappeared. This very disease [syphilis] will pass away, and later on will have a resurrection, to be seen by our descendants, just as it is to be believed that it was seen in past ages by our ancestors; and there are no few indicia of this. A certain barber (surgeon), a friend of ours, had a fairly old

little book of tried prescriptions, of which, amongst others, there was one entitled "For Crass Scabies which Occurs with Pain in the Joints;" he, then, when the disease was quite new, remembering the medicine, consulted certain physicians as to whether he should use this medicine in the new contagion, which he thought to be meant by "Crass Scabies;" the physicians, after examining the medicine, however, strictly forbade its use, because it consisted of mercury and sulphur. He would have been lucky and incredibly wealthy had he not consulted the physicians, for he obeyed and did not venture to try the medicine. When at length he tried it and recognized that it was the best medicine, he felt very much aggrieved that he did not use it sooner, and that the profit he should have had, was taken from him by others. From this, we can assuredly see that this disease had been seen in other ages.

There are those, too, who consider Avicenna to have meant it in his chapter on Olibanum when he says that Thus [Frankincense] applied with a mixture of vinegar and oil is effective against pain. There is a pain, he says, with which appear on the body something like Verrucae and spreading like Formicae. But that has no bearing, inasmuch as Avicenna here is translating what Dioscorides writes of Thus when he says that Formicant Verrucae in early stages and Impetigos, he relieves by treatment with vinegar and pitch, by which he understands Mirmecia.

To return, now, to our subject, the Morbus Gallicus is to be considered amongst the new diseases and those which rarely occur—consequently, both its causes and its principia are to be sought amongst those which also rarely occur—and, too, are such as are not only common to many at once, but also in many regions—and this can assuredly be referred to no other cause than the constitution of the air. What that is and from what principia arisen, is now to be inquired into.

Inasmuch as its analogies are to be found amongst contagions, its principia should also be analogous (as has been said) to those parts which receive the contagion; it is manifest that the principia of this disease are to be considered analogous to the crass and sordid phlegm. If, then, we have regard to the pustules which appear in this disease, or to the gummosities, or to the pains in the arms, everywhere we see nothing but mucor and sordities, and at length phlegmalentum, mucilaginous and crass. Consequently, its semina, upon which every spontaneous contagion depends, we

must consider to be somewhat similar; and, therefore, also, we must consider the air from which every contagion has its origin to have contracted a condition of the same character, the seminaria of which are sluggish and analogous to the phlegm, and in their turn are productive of others like the former. Inasmuch as this contagion is erodent, its seminaria must be sharp, although hemmed in and buried in much viscosity (lentos).

Such, then, are the principia which we should consider this infection as having, and we must consider that into the air there crept a kind of sordid putrefaction which had an analogy to crass and sordid phlegm in us, but in what way and from what causes, a condition of this kind was formed in the air, it is difficult to say. So far as reasonable conjecture can carry us, the following is certain:-

Whatever this cause and the origin may be, they must be among those which rarely occur; since, undoubtedly, this condition in the air which produces this rarely seen contagion is among those which rarely occur.

As we have said above, sublunary affairs are changed and affected in various ways by the things that are above, that is, the sky and stars—and it is apparent that there can be nothing which can affect the air so evilly in so many regions and over so much territory, or can produce such tremendous results when they do occur, except the conditions of sky and stars.

It has been demonstrated above what mighty and important things the stars can introduce here on earth when many of them are in conjunction; and such a conjunction our age has seen of three superior planets, Saturn, Jupiter and Mars, a conjunction which rarely occurs, and when it does occur often ushers in great events, as well because these stars are the most potent as because such a conjunction is long lasting by reason of the slowness of the motion, particularly of Saturn and Jupiter. The astrologers seeing this conjunction, prophesied great diseases to be impending. If, then, we are to say anything on probability, this is to be considered the fact.

It is, therefore, to be believed that on this conjunction of the stars taking place, there followed a tremendous traction of vapours, which, mixed with the air and agitated in various ways, brought in a sordid putrefaction from which were imported to us these seminaria, which have an analogy to sordid and mucous humours such as crass and mucous phlegm—whence at length was born that contagion which soon affected so many human beings and so many

regions, partly by the air itself introducing these seminaria and principia, partly by the contagion passing from one to another. So much for the origin of the disease and its principia.

So far as its materia is concerned to which these principia have analogy—that this is the sordid and crass phlegm, as we have said, can be made perfectly manifest. For, if we consider the pustules, all these are pinguid and dripping with an incredible amount of mucor—if the gummosities, these consist of concreted phlegm—if the pains in the arms, these are persistent, extensive, troublesome at night.

On dissections being made, a certain lentor is seen in the nervi and the coextensive arms, from which no one can doubt that the materia of this contagion is mucous and crass phlegm.

The pustules, indeed, seem to have their origin from the least crass, the gummosities from the most crass, and the pains from the medium phlegm.

Then the contagion creeping through the mass of the blood and making food for itself in the phlegm, that part which is least crass and least fat was driven outward to the skin, and there by degrees was concreted into pustules; while that which was crasser and less fitted to be expelled as far as the skin, remained around the nervi and arms, where it excited the most severe pains, and coagulated around certain parts and concreted into gummosities.

The contagion was not prompt to be caught by reason of the lentor in which the seminaria were buried, but it required a certain thorough heating of the bodies so that they by some process became seminaria and could be agglutinated to each other, propagate themselves by analogous food—which non-heated bodies cannot do like as they could if coagulated. For the same reason, also, the contagion lay long dormant within the body before it made itself manifest—inasmuch as it crept sluggishly on account of the frigidity and crassitude of the materia, then ate its way, and even attacked the solid parts by reason of the sharpness of the seminaria in the dense materia when they became active and putrefaction advanced.

The little ulcers appeared first around the pudenda, because there the first origin of the contagion took its beginning, and for the most part in coition.

These ulcers were disagreeable, as well because that part of the body is putrid enough in itself, as because, when the seminaria were dispersed from that part, it happened that when one part was healed by treatment, the disease appeared elsewhere.

The pustules for the most part began in the scalp, partly because that part of the body was in a way analogous by reason of the sordities and crassitude of the humor wherewith it was nourished, and partly because every evaporation is carried upward, while in every putrefaction evaporation is excessive.

Those in whose case there were many pustules had less of pains, inasmuch as much materia was excreted, and at the same time this is a symptom of less crass materia; on the other hand, in those in which it was crasser, more pains appeared and fewer pustules. The materia, indeed, which gave the pains was not fixed in the joints themselves, because it was too crass to penetrate the joints, wherefore it remained for the most part over the nervi and arms. Moreover, it was more troublesome at night and after sundown, because the natural heat is accustomed during the day to seek the exterior, being called for by Nature, ever vigilant over operations, to those members which are accustomed to be moved and excited by the light of the sun—wherefore it fostered these members and dissolved the ventosities which stretched the arms and nervi and tortured them; and at the same time it concocted the materia. But at night the heat is accustomed to turn inward and to desert those members to which it is called out by Nature during the day; and, consequently, the pains are excited and the distentions are more increased, the materia being destitute of the fostering heat to dissolve the ventosities.

The years gliding by, a change, indeed, took place in this disease, inasmuch as the original condition which was in the air now ceased, and the disease had no other method of propagating itself but by contagion of one to another, by reason of which change it became fixed. Now, every contagion according as it departs the more from its first origin and principle, becomes the more dry and earthy on account of the adustion which continuously is joined to it; wherefore the contagion of the first period, nearer, as it were, to the source, appeared more sordid and pinguid; and more of the pustules, fewer of the pains occurred; in the succeeding years, what was adust and crass gave fewer pustules and more pains; for, from the beginning, where there were more pustules, there were fewer pains, and where there were fewer pustules there were more pains.

Later on, and in these modern years, as though the contagion had grown senile, a still greater change took place; for many gummosities appeared, but the pustules were few, and they were dry,

and the pains almost wanting or much less severe, because the materia, by reason of crassitude, very easily was concreted into gummosities; but it was not easily expellible to the skin or capable of remaining around the arms. What does get out to the skin is a kind of thin phlegm, which acquires a certain saltiness from adustion, for which reason it takes away the pabulum brought to the roots of the hair, and it soon falls, as in *Porrigo*, *Alopecia* and *Dry Achores*. Probably, too, the same thing now occurs in this disease which happens in *Alphae*, in which the hair falls, on certain white mucilaginous materia making its way to the roots, for we have seen some whose beard had fallen out, have a certain similar humor coextensive under the skin. This might now very easily come out in evaporation and secretion, which is formed from this materia and almost vitreous by coagulated vapors.

In whatever way it is produced, we must consider that the decadence of this disease has begun, and that it will not be long before it will be unable to propagate itself, because, day by day, the materia is becoming more frigid and earthy, and in it, day by day, the seminaria become not only fewer but also weaker, for which reason this contagion is not now so easily taken as formerly it used to be—wherefore, moreover, it will at length come to pass that it will not be able to propagate itself, but will cease, and at a later time will recur when the same principia and the same causes themselves recur. It is, moreover, a familiar contagion in certain regions as in the island called *Hispania* and other places near, for the reason, as we have said, that the same condition which length of time has brought to us is effective there to produce this disease in the same way as *Egypt* and *Judaea* have a kind of familiarity with *Elephantia*.

We have now shown what originally were the principia and the causes of this new contagion, and in what it consists, and what analogy it has, and what are the accidentia of it, and its symptoms so far as have been determined up to the present time.

JEAN FERNEL

(1497-1558)

A BRILLIANT physician of France, whose deserved fame has suffered with the passing of years, is JEAN FERNEL of Amiens, court physician of Henry II and his queen Catherine de Medici. In his own time he was a recognized authority. His "*Universa Medicina*" (Paris, 1554) was the greatest medical text of the period and profoundly influenced the practice of medicine throughout Europe. Its organization commands our admiration today, especially in that the sciences of physiology and pathology are recognized as basic to that of therapeutics. Three sections corresponding to these three fields make up the "*Universa Medicina*." The second division ("*Pathologiae Libri VII*") is the first medical work to be called a text of "*Pathology*." In this section the science is treated in its general and its special aspects, just as in a complete modern work. It is obviously based on extensive reading and the author's own profound thinking, and must have proved of the same value to medical students and practitioners of his time as the best of our texts of physiology, pathology and medicine are today. The following section is from that portion of the work which might be termed the "*Special Pathology*."¹

CAUSE AND SYMPTOMS OF DISEASES OF THE KIDNEYS

(From the *De Partium Morbis et Symptomatis* in
the *Universa Medicina*)

Few diseases affect the kidneys; they are inflammation, obstruction, abscess, and ulcer. Inflammation, more properly called nephritis, rarely takes place in the kidneys, because their firm and hard flesh admits a fluxion with difficulty. Nevertheless it may occur in kidneys contused by a blow or fall, a fluxion through the draining veins being thus brought about. Great heat, severe pain, and a pulsation in the space between the last rib and the hip, testify to the presence of this condition. This afflicts with distention both the neighboring parts around the praecordium, the loins,

¹ Translation by William H. Wilder, Jr.



Jean Fernel, medicus Francus.

Te sol produxit dubia vt paradoxa valerent,
Sensibus vt liquidis arsque pateret Auūm.
Ingens Ferneli τὸν νῦν λέγουσιν ἄνδρα.

PLATE 4. JEAN FERNEL (1497-1558)

hips, pubis, and the private parts. Coldness of the extremities and numbness from direct thirst are present. Micturition, at first thin and bloody, then thick and mucinous, is accomplished with burning and labour.

The belly is obstructed and sluggish. Hence a distention of the abdomen, steady fever, nausea, or eructation, and constant vomiting.

Obstruction of the kidneys has various causes: they are sand, calculus, and a thick and viscid humour. This latter is indeed rare and scarcely ever found, since by the humour alone, whether thick or sluggish, the entire kidney is stopped up; by calculus or sand, which occur more frequently, the urine alone is suppressed. Sand does not obtain its substance in the internal cavity (i.e., pelvis of the kidney. Ed.) but in the kidney itself. Owing to this fact it is hard and red and retains the substance and color of the kidney. Flowing thence the secreted matter is carried into the cavity and slips along into the bladder by the ureters, making the urine sandy. If a cure is neglected the particles will in time become thickened or will augment and form a calculus by collection and adhering to each other. This substance is then expelled from the kidneys into the cavity, and when it flows along, severing, and so to speak painlessly lacerating, the part of the kidney to which it clung, it draws blood. This blood is poured out like the urine, and makes the latter thick, turbid, and almost black in color. Moreover the stone, once freed from the kidney, is of such a small size that in a short time it makes its way into the head of the ureter, whence it proceeds to the bladder with much force and nephritic pain. If it is very large, jagged, or pointed, it may stick on the way and tear the ureter with the greatest tortures. But it sometimes persists and remains in the cavity of the kidney if, because of its size, the path of the ureter is not large enough for it. Thrust about and disturbed herein it often brings on a sharp pain, especially when it glides ahead and enters the head of the ureter; and the latter softens with the calculus moving back and forth to and from the cavity of the kidney. Here (unless in time they proceed) by their continual meeting the small stones coagulate into a true calculus of the kidney, having no one definite size, nor shape, nor color. Becoming strengthened this almost fills the cavity of the kidney and keeps the still forming stones from getting out, and from then on a calculus of the kidney covers and conceals the old nephritic pains. The heaviness of the affected part, which hardly allows the

spine to be flexed, and its pain, which, unlike that caused by a catarrh, is quite apparent by pressure of the external parts, show that this is brought to pass in the kidneys. In no visible tumor will you find the sense of pain any greater, especially when the kidney itself is constrained from pressure on the belly by gas or faeces, by lying on the wrong side, or too violent exercise. Nephritic pain returns at intervals without regard to the excretion of the calculus. A bloody urine results from work and hard riding. Then indeed the calculus by its weight and attrition bruises the kidney and often without its being felt lacerates and ulcerates it. As a result blood is passed with the urine. Torpor of the legs, which results directly from the kidney, troubles some people. The substance of calculi is a thick and viscid humour in the kidneys analogous to the blood running from them, coming either from an overloading or from a parched and earthy blood. The inciting cause is believed by all to be the immoderate heat of the kidneys, which is able to turn to stone these burning, dry, hardening humours. But indeed another cause must be mentioned as being far more efficacious and more frequent, the inborn stony and calculous disposition of the kidneys. Whoever inherits this from his parents very rarely escapes the torments of calculus, in spite of his preventive efforts, since indeed this disease is more hereditary than all others, so that in many the calculus is procreated along with the kidneys. Furthermore the most important of the contributing causes are leisure and daily sleep, lying stretched out flat.

An abscess of the kidneys in which purulent matter is gathered, rarely occurs from phlegmon, but frequently from a foul ulcer that is not cleaned out, in the manner that I shall forthwith describe. Nevertheless in the coction of the phlegmon, pus arises and shortly an abscess of such size is formed that, the kidney being swollen, a tumor projects in the region of the loins and the ilia. Horrible fevers occur; there is a greater sense of dulness than before. But once the abscess is ruptured the pus is borne off with the urine, followed subsequently by the waste matter or decayed flesh from the putrid substance of the kidneys.

Once the abscess is emptied and cleaned there remains a very persistent and almost incurable ulcer, for the portion of the substance that is consumed by putrefaction or attrition can never be restored nor grow together, since this flesh, like all other, is inherited, and the urine, constantly flowing past, does not allow the

ulcer to close. For this reason it is kept perpetually raw like a fistula. The indication of this is that at one time pus, at another a mucous matter mixed with urine, flows from it; and therefore a white, turbid urine much resembling milk, which gives a purulent or mucous sediment, is passed. An ulcer from an abscess derived from a phlegmon is rather rare. Nor is it to be thought any less rare because they say that either by the bitterness of the matter given forth, which is eating away the kidney, or by some blow or accident bursting the veins of the kidney, this is brought to pass. Frequently and, indeed, nearly always, an amalgamation of the calculus takes place within, an amalgamation which either tears the kidney by its own weight, or diminishes and consumes it by attrition. So we often observe the entire flesh or substance of the kidney eaten away, and the pus and many calculi wrapped up in a membrane, much like a pouch. The fact that the urine was at one time purulent, then bloody, especially as a result of exercise and labor, and the fact that no fatiguing fever or only a very light one was present, are arguments showing the ulcer to have resulted from these causes. Moreover, if ever the pus is confined by obstruction of the head of the ureter, it gradually either overflows into the large veins by seeping through, and pollutes the blood and condition of the body (for this reason I have often noticed people with calculus to swell and grow pale as with the white phlegmasia), or, having congested its seat, greatly distends the ilia and loins, from which it trickles profusely for quite a while if the skin be opened. Frequently a large calculus with pus is expelled or extracted therefrom. Whenever this happens almost all the substance of the kidney is internally consumed with purulence, and pus forming in excess in the membranes of the peritoneum leads to fluctuation. I have seen the abundance of this distend the entire region of the abdomen and loins and real pus be expelled thence by vomiting or defecation.

Nephritic pain is the sharpest torture of the kidneys, or of the ureters, which have a very highly developed sensitiveness. This pain, situated at the site of the kidneys, is fixed to one side or the other, unless in the meanwhile it is drawn to the hip or the testicle, which lies in a direct line along the course of the ureter. It does not wander about the middle of the belly, or all through that part, murmuring like a colicky pain; nor does it always become mitigated to a scattering rumbling when once the belly has been emptied and purged, but with its size and fierceness it rends the peritoneum.

By this the bowels and stomach are turned upside down and vomit first slimy, then bilious matter. When the illness begins, the urine is small in amount, thin, and watery; now and then it even stops. Later it comes out more copiously, thicker, and full of sand, and a certain feeling of heat in it compels one to make water more frequently. Lying on the diseased side decreases the pain; lying on the other increases it. This pain is frequently repeated; colic occurs rarely. The cause of so much torment can not be stated as inflammation, or grumous blood, or thick humours, because soft and fluid things are easily accommodated, and because, as I have observed, a much thicker mucous and indeed concreted pus is passed through the kidneys with ease. The cause of pain is calculus alone, which is extremely hard, uneven, and scabrous when it travels down through the narrow ureter. It dilates and lacerates this with great force and in this fashion is extremely torturing. In those who have already been long used to nephritic pains I have at times found the ureter dilated to such an extent, that the large finger could be inserted into it. Average sized stones could make an exit through this without trouble, stones which previously would not have proceeded without the greatest pain. But those who have never, or only rarely and lightly, been affected by nephritic pains are put in agony by the smallest stone. Nevertheless it is difficult to distinguish this from colic at first since nothing can apparently be seen to flow away. Once the pain has been calmed and assuaged one must consider carefully whether the cause of pain has been forced out into the bladder or whether it has migrated again into the cavity of the kidney. If it has been forced on, one must take care lest it remain there and a calculus be formed in the bladder by the frequent assembling of matter. But if the calculus be ejected with the urine, one must judge whether it be solid or compacted from an adhesion of small stones. For a method of treatment is arrived at from these facts. Nor are they to be believed who affirm that white calculus arises only in the bladder, and red in the kidneys; for purulent kidneys give rise to white ones as well.

MARCO AURELIO SEVERINO

(1580-1656)

AMONG THE first to use illustrations to supplement descriptions of anatomical change was MARCO AURELIO SEVERINO, a Neapolitan surgeon and reformer in the field of surgery in Italy. With Paré and Fabricius Hildanus he stands as a pioneer in surgical pathology, and his "De Recondita Abscessuum Natura" (1632) is in reality the first illustrated text in that field. All sorts of deformity and pathologic change are included under his term "abscessus," the treatment of which by surgical means he is at great pains to describe. His chapter "De Strumis Mammarum" has been chosen for reproduction here, as it shows how clearly Severino had grasped the concept of the benign as opposed to the malignant state of tumors.¹

STRUMA OF THE BREAST

The breasts are subject to four severe affections or tumors: glandular, strumous, scirrhus and cancerous. This last, moreover, is caused by a perpetual heating of the juices, and for this reason it is both most offensive, and displays most severe symptoms. All the rest, since they do not arise from heated humours, are so much the less injurious. While because of these things, this particular type is most easily detected, it is very difficult to distinguish the others. Scirrhus, moreover, since it often occupies the entire body of the breast, is therefore immovable. Strumae and glands neither occupy the entire body of the breast nor are immovable, but can be grasped by the fingers and moved about. It is with difficulty, however, that I discriminate between glands and strumae, and many will have easily confused the names of each. Galen illustrates this when he says "a struma is a scirrhus in a gland." And whatever a gland may be, unless it is a hard or practically scirrhus tubercle you will certainly not find in his works, no matter where you look. Nevertheless, in Aetius, second to none among the subsequent Greeks, *Tetrab. 4. serm. 2. c. 5*, you may read other matters pertaining to strumae and glands.

¹ Translation by William H. Wilder, Jr.

Evidently strumae are far more harmful, and more troublesome and injurious than are glands, which, indeed, remain for long years unaffected by nature and medicines. Moreover, for an interval of days they excite only a slight and momentary pain; during other days they bring no feeling of pain or other sensation. So they are plainly wrong, and cannot be justified, who think that type of affection in the breast is an incurable cancer, and wish to cure it by painting on some remedy. Furthermore, since it does not adhere to the underlying flesh and is of the same color, and does not become surrounded by turgid veins, no one who is not unlearned would call it a cancer. Therefore, whenever I come across such a nodule I immediately purpose to extract it, lest the evils of delay should later make it incurable. Without doubt, once the mass of acrid juices is broken up, a scirrhus in a lax part can take on the character of a cancer. Amatus Lusitanus writes of one of these, cured by him, *Cur. 32 cent. tertiae*, and Jo. Schenckius likewise, in *observ. 1. 2. tit. de mammis pag. 336*. Perchance this is also the struma of the ancient surgeon Meges, on which see Celsus, *lib. 5. C. 28*. The surgeon Meges is authority for the fact that "strumae" are found in the breasts of women. Ludovicus Mercatus also says, on this subject, that they ought to be cut or drawn out. He gives this advice *l. 1, c. 17, p. 137*: Having grasped the tumor on both sides with the fingers, first sew through underneath with needle and thread, then draw both ends of the thread, the tumor coming with it. After this is done cut out with a scalpel all the rest of the roots, leaving behind no part of the membrane that covers the nodule, just as you take the same precautions in the case of a steatoma or in an atheroma. This plan of removal I recall to have been set forth by Pareus in a cancer of the lips, from whose authority Mercatus perhaps borrowed the traditional proceeding. The matter is first discussed, however, and in the same way, by Cornelius Celsus, who proposes this (Bk. 7), for the extirpation of a tumor of the eye. And Ludovicus adds that the relieved breast is to be sewed together just like a fresh wound, unless something should remain inside, in which case it is not to be sewed together, but to be tended by wiping and draining. Johannes Fragosus also mentioned this curative procedure, in his *Opere chirurgico tract. de apostem. q. 61*, the lesion being designated *Zarathana*, as customary with his race.

I proposed this method of cure before a gathering of doctors for a certain honest woman, Lucana, serving maid of the most illus-



PLATE 5. AN UMBILICAL HERNIA. FROM THE
"NATURE OF ABSCESSSES" BY MARCO
AURELIO SEVERINO (1632)

trious duke of Busina, who had come by arrangement to Naples for consultation on her trouble. It was treated as such a strange and absurd direction that the doctors laughed. The senior physician denied that this should be undertaken with her, and still less that the swelling should be cut out, because the bodies in the breasts are glandular, that is, truly glands. Who can see how a learned man could teach this? No one less than Hippocrates himself did he take as an authority, who to be sure did not say this idly, but in all seriousness: ἀλλὰ ἡ ἀδένες οὐ ταῖσι στήθισι μαζοὶ καλεόνται, ἡ διείρονται, ἡ γάλα ποιέουσιν which, rendered literally, is as follows: "Nay more, certain glands on the chest are called breasts, and these swell, and give milk, etc." But aside from Hippocrates no one else says that the breasts are glandular bodies, not even the nipples of the breasts. And moreover, even if the breasts are glandular bodies, what prevents them from being cut out when diseased, since Hippocrates says in his *Amazonum historia* 1. *de aere, aquis, locis*, that you can safely remove the whole healthy breasts? This statement has all the more weight since Schenckius has mentioned it in several cases.

And so it appeared that nothing could be done toward preventive surgery because they were glandular bodies and this man willed otherwise. But, after this was approved, notwithstanding, my opinion was singularly confirmed by the outcome of the case. For, after the woman had been seriously upset and wearied by various medicines, both internal and external, by a slender diet, and by many sweatings, so that she made no progress, it could only happen that the tumor, which had fed the tinder of the disease, finally ulcerated. This soon became such an unbearable burden to her that in a short time she returned and assured me she would undergo any hazards. Certainly she would have committed herself to my care had not the winter fogs, which are, according to Hippocrates, bad for ulcers, hindered her.

In the meanwhile, almost as if by divine favor, another case confirmed my opinion, viz. that of Aurelia of Alexandro, a most excellent woman, troubled for two years by a cancer of the right breast, from whom, in spite of the opposition of the physician above mentioned and other medical men present, including both physicians and surgeons, we extracted with light forceps a spongy gland distended with pus which adhered to the center of an ulcer. After this was done she lived out her time in comfort. Let this be taken as one case of a spongy gland in the breast of a woman. But in men

another type of this same thing is found, a type which I recently cut out from a fistula of long standing in the arm pit of a man who already considers himself completely cured. Unhealed by others he had finally abandoned hope. In the spongy gland in his case I found two rounded pieces of flesh, opposite each other, with projecting lips on each side that resembled the snout of a ray or sea-hedgehog, and with a gap in between whence came the bloody fluid of the fistula.

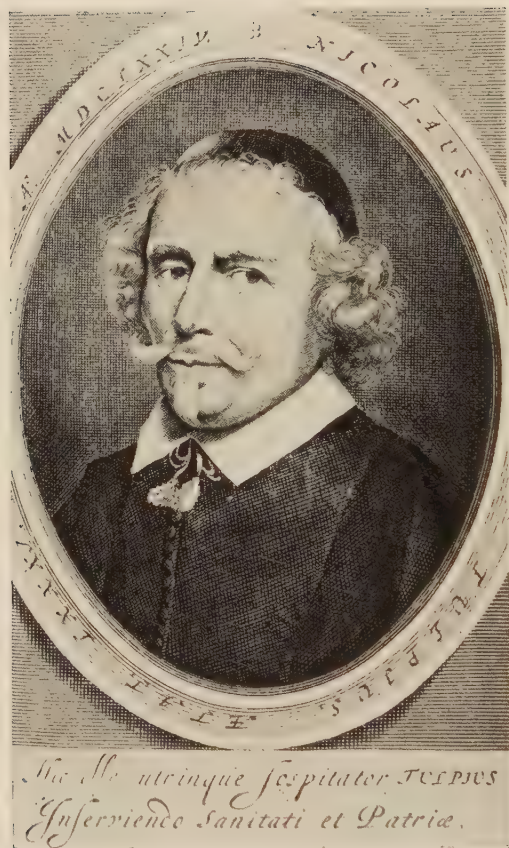


PLATE 6. NICOLAS TULP (1593-1674)

NICOLAS TULP

(1593-1674)

ONE OF the most frequently quoted of the early seventeenth century physicians was the energetic and capable Dutchman NICOLAS TULP. He left no school of medical thought, as did his contemporary Sylvius de le Boë, but he put on record well prepared accounts of many internal lesions, often hitherto unknown, in a way that made them extremely helpful to his colleagues and successors in diagnosis and practice. His book of observations, "*Observationum Medicarum Libri IV*" (1641), although tiny in comparison with many of the folios of the period, teems with original descriptions of great interest, and is by far the best illustrated of early pathologic works. Tulp obviously selected his cases for report from a large general practice. Many of them would still be considered sufficiently unusual for recording in our current medical literature. He publishes a good many observations on tumors in this short book, and one of these (*Cancer Vesicae, Observatio XXXVIII, Book IV*) has been chosen for reproduction here.¹

CANCER OF THE BLADDER

Physicians speak alike of internal and external cancer, but who among them has ever mentioned carcinoma of the urinary bladder? Nevertheless a clear example of this was brought to my notice, which I shall snatch from oblivion. Not in order that someone may search for a remedy for a disease that can not be healed, but that it should appear that continuous torment of the bladder is not always caused by calculus or ulcer, but is rather sometimes caused by this incurable cancer.

A merchant of Brabant, upon whom an operation for stone was performed in his boyhood, never thereafter passed water through the penis, but always through the anus, an opening remaining from the operation not only into the anus but the bladder as well. With this irregular disposal of urine, although he was otherwise healthy, when he reached his fortieth year a pain in the hips began to affect him, also a sharpness of urine, a perpetual effort to defecate and a

¹ Translation by William H. Wilder, Jr.

continual itching in the penis, from which he could only with the greatest difficulty squeeze a very small drop.

After keeping to himself this inconvenience for a period of ten years from modesty, he at last sought medical aid, earnestly but late. For what indeed could be done with an evil so deeply ingrained that it could not be taken out root and all? He never passed urine without a great feeling of pain, and whatever flowed from his anus was always mixed with sand or sloughs full of calculi. He had a constant trembling of the arms, and continual insomnia, with a slow fever, anorexia of the stomach, and so strong a distaste for food that even the mention of it frequently brought on a nausea. But in the presence of all these symptoms he took no remedy but the opiate Laudanum, on but two grains of which he could exist for three days without any evident pain. When at last his strength was gone and his body almost exhausted by hunger and pain he was obliged to abstain from use of the drug and died on the field of battle, putting an end to his unhappy life.

When we opened his body we found the kidney on the right side not involved, but that on the left infected with pus and steatoma. And the most satisfactory cause for this overwhelming ill was a foul and irregular carcinoma surrounding the meatus on all sides and which descended a finger's breadth from the urinary bladder to the rectum, through which for ten years more or less urine had flowed with unbearable pain to this unhappy patient. In order that other sick people may not be forced to undergo such misfortunes, I advise the strongly desired lithotomy, and that in the future, whatever may be on hand, physicians take every care that the wounds made by them may heal firmly.

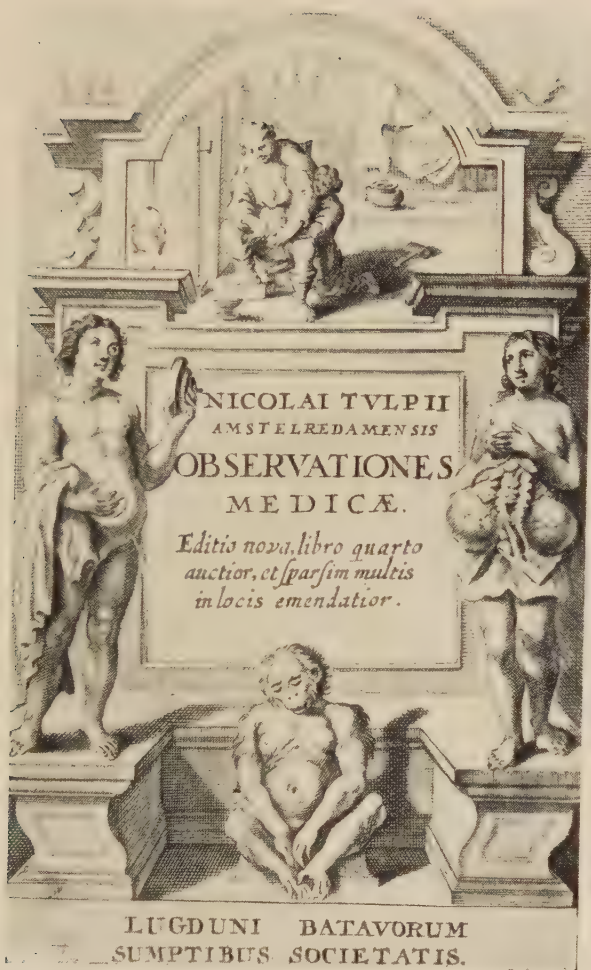


PLATE 7. TITLE PAGE FROM THE "MEDICAL
OBSERVATIONS" OF NICOLAS TULP

WILLIAM HARVEY

(1578-1657)

THE DISCOVERER of the circulation of the blood, WILLIAM HARVEY of Folkestone, England, cultivated pathological anatomy assiduously all his life, and made use of his observations in this field in support of the thesis forming his life work. The first of the following selections, both taken from those well known open letters to the Parisian anatomist Jean Riolan (1649), answering the latter's attack on Harvey's theories, illustrates the Englishman's clear conception of the value of knowledge of pathological anatomy for the understanding of medicine. The second records the first competent description of the mechanism involved in the state of "passive hyperemia," and adds two interesting observations in the pathology of the vascular system.¹

A PASSAGE FROM THE FIRST ANATOMICAL DISQUISITION ON THE CIRCULATION OF THE BLOOD, ADDRESSED TO JO. RIOLAN

Some few months ago there appeared a small anatomical and pathological work from the pen of the celebrated Riolanus, for which, as sent to me by the author himself, I return him my grateful thanks. I also congratulate this author on the highly laudable undertaking in which he has engaged. To demonstrate the seats of all diseases is a task that can only be achieved under favour of the highest abilities; for surely he enters on a difficult province who proposes to bring under the cognizance of the eyes those diseases which almost escape the keenest understanding. But such efforts become the prince of anatomists; for there is no science which does not spring from preexisting knowledge, and no certain and definite idea which has not derived its origin from the senses. Induced therefore by the subject itself, and the example of so distinguished an individual, which makes me think lightly of the labour, I also intend putting to press my Medical Anatomy, or Anatomy in its Application to Medicine. Not with the purpose, like Riolanus, of indicating the seats of diseases from the bodies of

¹ From the translations for the Sydenham Society by Robert Willis, London, 1848.

healthy subjects, and discussing the several diseases that make their appearance there, according to the views which others have entertained of them; but that I may relate from the many dissections I have made of the bodies of persons diseased, worn out by serious and strange affections, how and in what way the internal organs were changed in their situation, size, structure, figure, consistency, and other sensible qualities, from their natural forms and appearances, such as they are usually described by anatomists; and in what various and remarkable ways they were affected. For even as the dissection of healthy and well-constituted bodies contributes essentially to the advancement of philosophy and sound physiology, so does the inspection of diseased and cachectic subjects powerfully assist philosophical pathology. And, indeed, the physiological consideration of the things which are according to nature is to be first undertaken by medical men; since that which is in conformity with nature is right, and serves as a rule both to itself and to that which is amiss; by the light it sheds, too, aberrations and affections against nature are defined; pathology then stands out more clearly; and from pathology the use and art of healing, as well as occasions for the discovery of many new remedies, are perceived. Nor could any one readily imagine how extensively internal organs are altered in diseases, especially chronic diseases, and what monstrosities among internal parts these diseases engender. So that I venture to say, that the examination of a single body of one who has died of tabes or some other disease of long standing or poisonous nature, is of more service to medicine than the dissection of the bodies of ten men who have been hanged.

FROM A SECOND DISQUISITION TO JOHN RIOLAN, JUN.

From any long vein of the forearm get rid of the blood as much as possible by holding the hand aloft and pressing the blood towards the trunk, you will perceive the vein collapsed and leaving, as it were, in a furrow of the skin; but now compress the vein with the point of a finger, and you will immediately perceive all that part of it which is towards the hand, to enlarge and to become distended with the blood that is coming from the hand. How comes it when the breath is held and the lungs thereby compressed, a large quantity of air having been taken in, that the vessels of the chest are at the same time obstructed, the blood driven into the

face, and the eyes rendered red and suffused? Why is it, as Aristotle asks in his problems, that all the actions are more energetically performed when the breath is held than when it is given? In like manner, when the frontal and lingual veins are incised, the blood is made to flow more freely by compressing the neck and holding the breath. I have several times opened the breast and pericardium of a man within two hours after his execution by hanging, and before the colour had totally left the face, and in presence of many witnesses, have demonstrated the right auricle of the heart and lungs distended with blood; the auricle in particular of the size of a large man's fist, and so full of blood that it looked as if it would burst. This great distension, however, had disappeared next day, the body having stiffened and become cold, and the blood having made its escape through various channels. These and other similar facts, therefore, make it sufficiently certain that the blood flows through the whole of the veins of the body towards the base of the heart, and that unless there was a further passage afforded it, it would be pent up in these channels, or would oppress and overwhelm the heart; as on the other hand, did it not flow outwards by the arteries, but was found regurgitating, it would soon be seen how much it would oppress.

I add another observation. A noble knight, Sir Robert Darcy, an ancestor of that celebrated physician and most learned man, my very dear friend Dr. Argent, when he had reached to about the middle period of life, made frequent complaint of a certain distressing pain in the chest, especially in the night season; so that dreading at one time syncope, at another suffocation in his attacks he led an unquiet and anxious life. He tried many remedies in vain, having had the advice of almost every medical man. The disease going on from bad to worse, he by and by became cachectic and dropsical, and finally, grievously distressed, he died in one of his paroxysms. In the body of this gentleman, at the inspection of which there were present Dr. Argent, then president of the College of Physicians, and Dr. Gorge, a distinguished theologian and preacher, who was pastor of the parish, we found the wall of the left ventricle of the heart ruptured, having a rent in it of size sufficient to admit any of my fingers, although the wall itself appeared sufficiently thick and strong; this laceration had apparently been caused by an impediment to the passage of the blood from the left ventricle into the arteries.

I was acquainted with another strong man, who having received an injury and affront from one more powerful than himself, and upon whom he could not have his revenge, was so overcome with hatred and spite and passion, which he yet communicated to no one, that at last he fell into a strange distemper, suffering from extreme oppression and pain of the heart and breast, and the prescriptions of none of the very best physicians proving of any avail, he fell in the course of a few years into a scorbutic and cachectic state, became tabid and died. This patient only received some little relief when the whole of his chest was pummelled or kneaded by a strong man, as a baker kneads dough. His friends thought him poisoned by some maleficent influence, or possessed with an evil spirit. His jugular arteries, enlarged to the size of the thumb, looked like the aorta itself, or they were as large as the descending aorta; they had pulsated violently, and appeared like two long aneurisms. These symptoms had led to trying the effects of arteriotomy in the temples, but with no relief. In the dead body I found the heart and aorta so much gorged and distended with blood, that the cavities of the ventricles equalled those of a bullock's heart in size. Such is the force of the blood pent up, and such are the effects of its impulse.

JOHANN JAKOB WEPFER

(1620-1695)

FEW SYMPTOM complexes of disease were as clearly defined in ancient times as those of sudden "stroke," or apoplexy. The notions on its etiology were vague, however, until the relation of cerebral hemorrhage to the phenomenon was discovered by JOHANN JAKOB WEPFER of Schaffhausen, Switzerland. This physician was particularly interested in diseases of the head, and made many post-mortem examinations in cases where the symptoms during life had seemed to be cerebral. Very early in the course of these investigations he stumbled upon one explanation of apoplexy. In 1658 he published under the title "*Observationes Anatomicae ex Cadaveribus eorum quos Sustulit Apoplexia*" the case records and necropsy reports of four patients who died of stroke and whose sudden symptoms Wepfer found, on opening the head, to be the result of severe cerebral hemorrhage. This book went through several editions testifying to Wepfer's increasing knowledge of the subject, but preserving the original records on which his first understanding was based. The selection below is the opening chapter of this work, recording a case of Wepfer's in 1655.¹

Johann Jakob Reiter of Kenzingen, Breisgau, a man about 45 years of age, of pleasing appearance, with wavy blond hair, of strong character and descended from a father of consular rank, turned his attention to letters from boyhood, and could have lived very well, had not that deplorable fate which was to devastate all Germany intervened. This disaster, involving his fatherland in a national calamity, caused him to undergo various hardships, especially the harsh tyranny of the famine of the fatal year 1634. This misfortune obliged him to eat things of a nature as disgusting to others as poison. Hence, after many delays and vicissitudes, he went to Rheinovium, where he was for several years a school-master. At last he was taken into a monastery by the most reverend and learned master D. Bernardus of Freiburg, most worthy abbot of the celebrated monastery of that name, and my much revered master. Here he served faithfully as a chamber-servant for several years. As long as I knew him he ate sparingly, but it is true he indulged

¹ Translation by William H. Wilder, Jr.

more in drink; he did not, however, sacrifice too much to Bacchus. He was somewhat more prone to anger, but did not like brawls, or make trouble in quarrels. At several times while he was living in this monastery, he was afflicted with the gout, which raged for the first years in the joints of his feet, but in following years did not spare his other joints. While he wrestled with this disease he contracted no worse one, as if he was made immune by virtue of his having it. From the year when this disappeared up to shortly before his death, he never felt the usual pains; this may have been brought about by secret medicaments, or by the inability of nature to press the cause of the disease any further towards the joints.

From that time on he was troubled by an annoying cough, which was believed to be consumptive, since the gout was thought to have stopped. Indeed because of suitable remedies that I proposed, the cough ceased and he lived comfortably enough for about a year, except for an intestinal hernia, brought about by the violence of the cough. In the year 1655, on the seventh of November, the fifth day from the full moon, while in good health, he assisted the most reverend abbot in performing the service in the morning, as was everyone's duty. When he had done this he withdrew to his chamber according to his habit; here by chance one of the servants went to call him and found him lying on the ground, deaf to all calls, a mere figure of a body, insensible to striking or pinching. People gathered, they poured "*aqua antiapoplectica*" into him and tried whatever else came to their hands, but all in vain. I was called to him, and when I arrived in about two hours, I saw him with a livid pallor, deprived of all senses and power of motion, excepting respiration, which was quiet enough. And if I had not noticed his respiration, at the first guess I should have said that he was affected by *leipothymia* or syncope, for indeed his face was bloodless and his extremities were livid and, like the nostrils, cold to the touch. At first the pulse was strong, full and rapid, then weaker, less full, and more frequent. The respiration also became more laborious, soon took place irregularly, and often seemed about to stop. I omitted no kind of suitable remedy, but did not dare to open a vein because of the feebleness and shortness of respiration. In the tenth hour before the meridian the body was shaken by a peculiar motion, and a quantity of white, viscid, thick sputum issued from the mouth, but no blood came forth. From then on his vitality began to decrease more and more, and the extremities to grow colder. The



PLATE 8. JOHANN JAKOB WEPFER (1620-95)

first hour before the meridian of that day he died. At the instant he succumbed to the affliction he excreted through the bowels a good deal of black faecal matter, which I attributed to a certain chalybeate wine of which he used to take a cup morning and evening, by whose empiric advice I know not, nor for what reason. With the indulgence of the most reverend abbot afore mentioned, a great patron of letters and all the fine arts, I opened the head. After I had removed the skull-cap and cut away the dura mater, a great quantity of blood, which was copiously distributed in this space, flowed from the fairly large cavity between the dura mater and the lepto-meninges. Nor was blood stagnating only around the base of the brain; it had reached to the vertex both anteriorly and posteriorly, and had insinuated itself into almost all the sulci of the brain. On exposing the ventricles I found them also all filled with blood, not even excepting the fourth. The lateral ventricles, as if lacerated near the base, resembled fissures over-distended with blood. I could easily guess that the quantity of extravasated blood exceeded two pounds. I was able to see nothing more in the entire brain, the ventricles and surface being contaminated with much grumous blood; nor was I able to perceive a ruptured vein or artery. It is, however, certain that no violent external means, whether a blow or a fall, could have been the cause of such a rupture of the blood-carrying veins, since not the slightest trace of any contusion appeared when the hair was shaved off and the skin taken away.

FRANCISCUS SYLVIUS

(1614-72)

ONE OF the brightest lights of the great Dutch school of medicine of the seventeenth century was Franciscus de le Boë of Leyden, better known as SYLVIUS. As fertile in theory as industrious in practice, he put forth a series of medico-chemical doctrines that grew to the prominence of a new school of medical thought (the iatro-chemical system). This proved of perishable stuff, but in another field his teaching was more lasting. He brought anatomic understanding for the first time to what has been until recently the most widespread and fatal of endemic ailments, pulmonary tuberculosis. It was the current fashion in his time to group chronic wasting diseases under the appellation "Tabes." A further separation was made from this of "phthisis," which might be still more restricted as "phthisis pulmonum." The distinction was almost purely a symptomatic one until Sylvius emphasized the coincidence of a set of well defined lesions of the lungs with the symptoms of this "phthisis" or consumption, establishing at the same time the relation of the disease to the lymphatic system. To be sure his understanding and explanation of what he saw was highly faulty, and clouded by his now obsolete humoral pathology, but his objective picture of the morbid anatomic change opened up a route that led in a century and a half to the clear and final exposition of Laennec. It is regrettable that the whole of Sylvius' monograph "De phthisi" cannot be reprinted here, because of its length, but selections have been chosen which illustrate its character.¹

I. Among the affections following ulcer of the lungs and characterized by wasting of the entire body, pleuritis, particularly, is to be numbered. This disease, if neglected or not overcome, often goes into suppuration. Moreover pus not infrequently collects in the chest cavity, causing empyema, and from this acrid pus the lungs are frequently affected so that phthisis arises, which I now shall discuss.

II. We must understand that the name phthisis is not to be given to every emaciation, but on the contrary, only to that which follows

¹ Translation by William H. Wilder, Jr., from the *Opera Medica* of Sylvius, 1679.

ulcer of the lungs. Physicians universally employ the word in that sense.

III. In addition to the emaciation of the entire body other symptoms are to be observed which are peculiar to phthisis, viz., cough with excretion of pus, and hectic fever, made worse one or two hours after eating.

XXVII. The immediate cause of phthisis is an ulcer in the lungs of such duration that emaciation of the body with slow fever is caused by it.

XXVIII. Phthisis is more quickly caused by a foul ulcer of the lungs and secretion of acrid matter than by a more bland ulcer and matter that is less acrid.

XXIX. Among the causes producing an ulcer of the lungs first place must be given to peripneumonia, i.e. an inflammation of the lungs turning into an abscess, or cavity.

XXX. Secondly comes neglected bloody sputum, not cared for in time.

XXXI. Thirdly: an acrid, salty or acid humour running through the jaws into the trachea from the head and little by little eating away and ulcerating the trachea, and then the substance of the lung itself.

XXXII. Fourthly: a pituitous and viscid humor likewise descending from the head and jaws into the trachea, and adhering there until, made more acrid by the delay, it likewise, although more slowly, ulcerates the lung.

XXXIII. Fifthly: an acrid pus from the side in pleurisy, or from the thoracic cavity in empyema, admitted to the lungs, and producing there an ulcer.

XXXIV. When the aforementioned causes occur in a lung naturally faulty and inclined to phthisis, the disease is contracted much more easily and quickly.

XXXV. It is worth while to inquire into the cause for a natural disposition to phthisis. It is clear from frequent experience that entire families are so disposed to phthisis that very few members manage to escape this ill.

XXXVI. It is known, indeed, that this evil is hereditary and is handed on to the children by the parents, but in what this hereditary disposition consists is not equally well known.

XXXVII. I am not speaking here of faulty conformation of the thorax, either peculiar to an individual from the outset or from

birth, that is, congenital, or occurring in some individuals after birth as a result of a fall, contusion, or other accident. I mean rather an inherent and hereditary constitution of the lungs and other parts rendering several children of the same family prone to the disease; however well they may be, when they reach a certain age (in some this evil shows itself sooner, in others later) they suddenly contract phthisis and as often as not succumb to it.

XXXVIII. In order to explain this more easily I hold that the different humours in the human body change day by day, and are noticeably altered according to age, for the solid parts and the viscera undergo the same changes at various ages. This change can be observed particularly in glands, some of which sensibly diminish, while others rather grow and increase day by day.

XXXIX. So the thymus gland, which is fairly large in the foetus, decreases very much in the aging animal.

XL. That the peculiar constitution of the lung also, and its change with age, have a bearing on that which we are now discussing, phthisis, is abundantly shown, although up to this time it has not been possible for me to describe and explain definitely this changing constitution of the lungs.

XLI. Yet it is plain that there is a constitution of the lungs which is more easily affected and suffers from the humours dominant in one or another age.

XLII. In the meantime, if I may be permitted to suggest what seems to me more particularly true (and what is not permitted?), I believe this disposition to phthisis is to be sought and found not so much in the solid and neighboring parts as in the fluids.

XLIX. I have said that phthisis is aroused not only by pneumonia or inflammation excited in the parenchyma of the lung, with change into an abscess and rupture, but also by a vomica developed in the lung and ruptured there.

L. I must explain in a few words just what is meant by vomica. Some mean by vomica blood which is effused, not into the substance of the lung, but gradually into a membranous capsule where it collects and changes into pus. I do not dare deny that this might happen, although I do not remember ever finding any such thing on dissection, or anything whence I might deduce and conclude this with sufficient certainty.

LI. Therefore I shall set down what I have been able to observe, and make clear what I mean by vomica. I have frequently seen

larger or smaller glandular tubercles in the lungs, which on section showed a content of pus of varying degree. I believe, therefore, that these tubercles gradually form into pus, and when enclosed by their thin membrane constitute the vomica. I am certain that phthisis frequently arises from this cause.

LII. And I should not even fear to place that fatal disposition to phthisis which is hereditary in certain families, to the credit of these tubercles, if they are encountered in any form where they tend to suppurate.

LIII. I cannot on this occasion refrain from giving thanks to those physicians who have agreed with the truth of my views. For from this and from other similar observations, after investigating the wear and injury to neighboring parts, I finally became suspicious about the glands, which are very small and escape detection by the eye in a natural state, and become visible only when abnormally enlarged and distributed throughout the viscera and fleshy parts of the body.

LIV. These conjectures and cogitations of mine were given support by the fact that the glands of the choroid plexus are not visible unless of unnatural size; when they have grown to an unusual size they are even prominent. Secondly, they were supported by recalling glandular tubercles or glands in the lungs. In the third place the glands manifest in various parts of the body in a strumous or a scrofulous constitution, even though extremely small in the mesentery and sides of the neck in a natural condition, increase prodigiously in size and hardness and show themselves everywhere, when they were formerly almost invisible. They are conglobate not conglomerate, and those which appeared healthy and whole may have been conglobate and much poisoned by being close to the others.

LVI. From the aforementioned observations on the glands in a morbid constitution of the body I have judged that they are present even in a natural condition, but are so small as to be invisible, much like the capillaries in the ocular conjunctiva, which are so small normally that they are not to be seen unless blood stagnates in them, when they appear as red fibrils.

LVII. No one who has once seen those vessels in an inflammation of the eye will deny their presence, even though he sees them no more afterwards; so it would be against all reason for one who has once or more frequently observed the aforementioned glands in an

abnormal condition either around the choroid plexus, in the lungs, or anywhere else, to deny their existence, even though they are minute in a normal condition.

LVIII. And so perhaps if these conglobate glands are everywhere, that is constantly present in all parts of the body, both the parenchyma and the flesh, could not a lymph be produced by them which would, in an abnormal state, through some change in the atmosphere or nourishment, or through some affection of the mind, or particularly sorrow, flow out, either more acrid or more viscid, and thus become the cause of many affections, of sorrow, lassitude, and similar ills, in a manner of which we are largely ignorant, as we are of the source to which we should trace it?

LIX. Therefore, since we have observed vomicas arise in glands of the lungs that are normally imperceptible, but abnormally increased in size and visible, so we may conjecture that perhaps in these the hereditary disposition to phthisis is both to be sought and found.

GIOVANNI MARIA LANCISI

(1654-1720)

WEPFER'S DISCOVERY of the relation of cerebral hemorrhage to apoplexy, noted in a preceding selection, was supplemented a half a century later by a treatise from the hands of GIOVANNI MARIA LANCISI of Rome on the causes of sudden death in general. For some reason sudden and unexplained deaths, not due to violence, were unusually frequent in Rome in 1705-06. The situation appeared to Pope Clement XI sufficiently serious to warrant a special investigation, which he put in the hands of his trusted friend, the physician Lancisi. The results of this study are embodied in the monograph "De Subitaneis Mortibus," which Lancisi published in 1708. In no sense, to be sure, can this be called a modern work. The author was still much under the influence of the humoral pathology, and confused essential and incidental pathology in his post-mortem examinations, as the subjoined records will show. Nevertheless, the treatise was an original dissertation of great value, and pointed the way for subsequent development of much importance, particularly in forensic medicine. The selections presented here represent the first clear emphasis on organic defect in the heart as a cause of sudden death.

ON THE CAUSES OF SUDDEN DEATH AS CONCERNS THE HEART AND THE LARGE ARTERIES.¹

Next we should speak of diseases of the heart and large arteries which are speedily fatal. All of these, no matter how many are named, come to this, that they stop the intrinsic motion of the heart and bring about a fatal syncope. Three things, however, must be considered necessary to life in connection with the heart: first, harmonious structure of both the heart and the large arteries, secondly, freedom of the passages, and thirdly the moving power, which is called the pulsive faculty. Certainly from any one of these sources grave abnormalities may easily arise, which can promptly kill.

First, as to the structure, including the strength and continuity

¹ Translation by William H. Wilder, Jr.

of the fibers, villi and coats. Whenever, either from the infliction of a wound, or from slow consumption by an aneurysm, the point is reached where the continuity of the walls of the heart and large arteries is interrupted, death occurs with the gush of a large amount of blood. History No. V. [a case of aneurysm of the aorta] exhibits the state of those who perish suddenly from these circumstances.

When, however, some uncommonly severe ailment of the heart is responsible for a defect in the structure, arising first naturally and then augmented by disease, this fact often gives occasion for sudden death. For if the blood, from its delay in the *praecordia*, gradually becomes irritating and less fluid, it adds a new burden to the size of the heart. This depresses the heart toward the diaphragm to the point where it resists the force by which the heart is dilated and the blood sent into the arteries (in a word, those forces by which the body lives), so that not only does it come to equal that force, but often suddenly and unexpectedly overcomes it. We used to see this kind of death frequently and will give an especially clear example of this (among those which we reserve for the books we are now making ready on the heart and aneurysms) in History II in the following book, concerning those who have been suddenly snatched from the number of the living.

Now as to what pertains to the freedom of the passages: whatever cause can constantly and evenly impair, congest, or obstruct the *vena cava*, pulmonary artery, aorta, or the carotid arteries, so that the blood is kept from coming to the auricles and ventricles, or flowing from the auricles and ventricles into the larger branches of the arteries and the brain, can also bring on sudden death, as observers report concerning polyp of the large blood passages or tumors or bones obstructing or compressing the large vessels.

Moreover, since the moving power of the heart depends not only on the harmonious structure of the fibers, but also upon the fluids, both nervous and sanguinous, injury may occur, so that a man will speedily die, if any one of the fluids should be persistently lacking (hence syncope of the heart, and paralysis of the arteries), or develop any other lethal fault. This indeed happens, not only in times of plague, but also when the orifice of the ventricle or the heart itself is gnawed by worms, as Trallianus, Mesue and Schenckius report, when they say that many have perished suddenly for this reason. For worms of a certain species arm their proboscis with

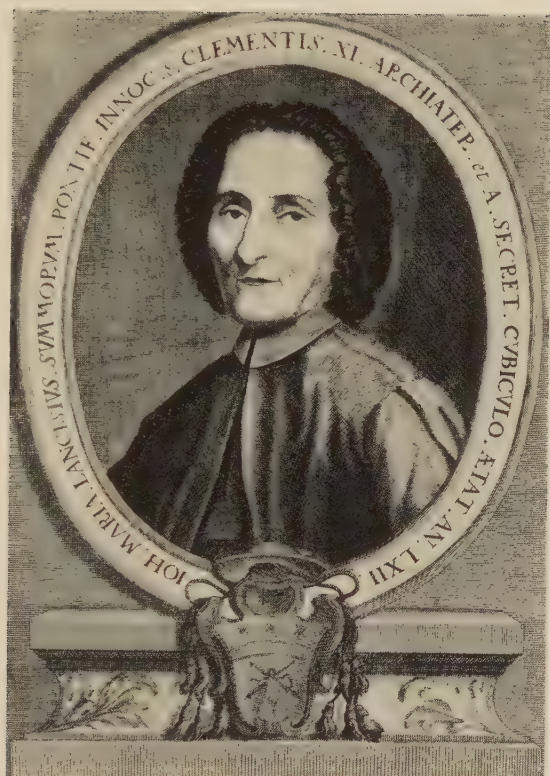


PLATE 9. GIOVANNI MARIA LANCISI (1654-1720) }

venom, so that, not strictly speaking by eating away, but rather by sprinkling the lesions with a poisonous fluid inimical to the blood and animal fluid within, they are wont to kill. All this is clear from what I have said before, so that I have judged it sufficient to pass over these things briefly.

This fact I think ought to be recalled here: that the motion of the heart and the large blood vessels is divided into systole and diastole, and both are necessary for life. So it may happen that one who is sick may die suddenly if the heart cannot be alternately compressed (for it can be affected by the weakly structure within or by a serious disease of the aforementioned fluids), or if it is unable to dilate. This may be caused either by a persistent spasm, or because it is compressed by a tumor of the heart itself, pericardium or adjacent parts. Thus we often see the knot of life suddenly severed when a blow is struck beneath the xiphoid cartilage, doubtless because in that one spot the orifice of the stomach, the center of the diaphragm, the aorta, the vena cava, and the pericardium, are assembled and strongly joined together by the nerves and the adhesion of tendons. And so, when there is suddenly excited, because of the strong shock of a blow, a convulsion of all the parts mentioned, the respiration and the circulation of the blood stop suddenly and simultaneously (especially in an ailing man) with fatal results. Thus Rasis affirms that sudden death may result from apostems of the heart. And therefore, as Hippocrates had said, "a pain of the heart, occurring more frequently in the aged, indicates a sudden death." For if a convulsion of the praecordium is obstinate enough, and if at the same time the blood, which ought to circulate, loses its necessary fluidity (as we say of convulsions of the brain), even if after this the spasm ceases, the blood will not meet the resistance encountered and continue its course, and thus easily sudden death would result. We shall be silent here on the poisonous causes discussed elsewhere, arising from the stomach and other viscera.

* * *

Moreover, now that examinations of human bodies are made more frequently, a thing the ancients, from horror, did sparingly, it is clearly shown that many who die suddenly were suffering from internal aneurysms or varices. We can deduce a most certain explanation for the distressing death from the presence of varices and aneurysms, which gradually reduce the blood vessels to such a

thinness that finally, and suddenly, they rupture. And indeed I cannot here conceal the fact ascertained from frequent experience, that aneurysms destroy unexpectedly those patients, particularly, who lead a less continent and temperate life. Those, indeed, who live sparingly, with sobriety, and continently, are apt to be taken off with another type of disease, a slow and insidious dropsy, with lasting agony. On this basis the physician in contact with the habits of his patients and their way of life may give his judgement wisely.

SUDDEN DEATH FROM SYNCOPE DUE
TO GREAT SIZE, PROLAPSE
AND ANEURYSM OF THE
HEART²

Some time ago a lackey of the most illustrious younger Marquis of Spada, named Phillippus Romanus (Turci), a man about twenty-five years of age, of slender habit, moderate stature and pale color, was seen to suffer from shortness of breath even on mild exertion. Within a year he was afflicted with a suffocating angina, from which he was freed by three bleedings in the course of a day. But to those around him there was apparent an ever increasing difficulty in respiration and recurrent transient palpitation of the heart, particularly when he walked at a quick pace, associated with an overwhelming sense of suffocation in the praecordium, and a pulsating weight above the center of the diaphragm. These symptoms increased to the point where he suffered while eating and after taking food. On the morning of the 4th of February of the present year 1706, he was afflicted with widespread cramps extending to the neck and collar bone, with inflammation of the throat. Nevertheless he continued to follow his master on foot about five hundred paces. The master delaying somewhere quite long, the lackey stopped with a comrade in a tavern and ate and drank copiously and indiscriminately. After an hour he returned home, where he was seized with a chill. He retired with his wife to the bedchamber to make warm at the fire of half kindled charcoal which burned there, and here a little later (perhaps from venereal excitement?) he was seized first with a slight weakness of the head, then of the forehead, and presently of the whole body, with most severe dyspnea, strangling of the heart and finally syncope, ending shortly in death.

² Translation by the editor.

DISSECTION OF THE CORPSE

When the abdomen was opened the small intestine was found somewhat reddish. The other viscera, however, were seen to have departed but little from the natural state, except for a little more turgidity and purplish hue.

A seat of his illness and final death appeared most plainly in the thorax. When this part was opened the lungs were found to be rather whitish, and the right one tightly adherent to the true ribs.

We perceived the throat to be suffused with redness and the trachea filled with a substance not unlike gelatin, but of sooty, blackish color within. The bronchial divisions were likewise inflamed, and manifested a sort of roughness.

The heart was soft and three times the natural size. In fact it exceeded the size of a bovine heart; after removal of the pericardium and expression of all blood it weighed two pounds and a half. Indeed the viscus lay right upon the diaphragm in such a way as to compress the esophagus, aorta and even the stomach.

Moreover, although externally it seemed to preserve its normal shape, the dissection furnished new material for skilled investigators given to philosophizing. For the auricle and right ventricle were found devoid of blood, although of the usual diameter, while, on the contrary, the left cavities were full of black blood and twice the width of the right. The adjoining aorta was likewise very large.

On dissection of the head the vessels of the pia mater were found more swollen than usual. The cortex of the brain, on the upper surface of each hemisphere and toward the posterior part, adhered tightly to the dura mater with a sort of callous glue. Finally the plexuses were made up of vessels abnormally distended with blood.

SCHOLION

Neither painful prolixity nor brevity will escape difficulty in determining the underlying causes in this case. The careful reader will first direct his attention to the native temperament of the patient and the very severe ailments which the unfortunate man suffered for a year before his death; secondly, he will think of the immediate circumstances of the death; and thirdly of all those facts observed on examination of the corpse. I trust sufficient light will come thereby to explain clearly the sudden death.

If we sum up in brief all the causes of this death, we are forced to fall back on the fact that for some time before death less vital spirit was secreted from the brain than the natural economy of this man demanded, whence resulted a greater lowering of vigor of the praecordia from the diminished separation of animal fluid through the cerebral cortex, as was apparent to us from the glutinous callus found there. Hence it proved that several factors at the same time conspired to the sudden death of this patient: first, there was a fresh exaltation of the saline-acid elements in the fluids, made most plain from the terminal inflammation of the throat; secondly, motion of the body when he needed rest; thirdly, gluttony and abuse of wine when a strict diet was necessary; fourthly, a suffocating irritation of the bronchi from the charcoal fumes, which was made apparent in the corpse by the sooty color of the trachea; finally, it might be added, venereal excitement was effective in driving highly impure and agitated spirits into a new and altogether abnormal movement around the diaphragm. Hence the heart itself, large from its own nature and stagnation of the blood, failed in all intrinsic motion, from scant strength of animal spirits.

FREDERIK RUYSCH

(1638–1731)

A PUPIL of Sylvius de le Boe, FREDERIK RUYSCH of Amsterdam, known chiefly for his discoveries in anatomy, secured a permanent place in the history of pathology by preserving in a form suitable for lasting demonstration, selections from the abnormalities brought to light in his dissecting hall. A record of Ruysch's pathological experience, and running guide to this museum, appeared in a series of atlases, the engravings of which were supplemented by a short descriptive text. The selections below and accompanying illustrations are from one of these atlases, "Observationum Anatomico-Chirurgicarum Centuria" (1691-1737).¹

OBSERVATION LXXVII

INTERNAL SCABIES OF THE BLADDER WITH GLANDULAR FLESHY EXCRESCENCES

Although the skin is commonly, and not incorrectly, considered subject to eruption, nevertheless I have several times observed the same thing in the inner wall of the bladder, attended by great pain, a desire for frequent urination, with excretion of purulent urine, and by so great an hypertrophy of the bladder that its thickness equalled that of the finger. And from this scabious infection grow tumors, or fleshy and glandular excrescences, pushing out from the inner wall of the bladder, which, if they grow near its outlet, frequently induce so great an ischury that urine cannot be passed without the introduction of a catheter.

Explanation of Fig. 62 [Plate 10]

- AA Urinary bladder of a man, the walls of which (BB) are greatly thickened.
- CC Inner wall of the bladder affected with a scabious infection.
- DD Ureters.
- EEE Tumors arising from the inner wall, the largest of which adheres by a pedicle to the inner wall.

¹ Translations by William H. Wilder, Jr.

OBSERVATION XXXVII

CARIES OF THE RIBS FROM ANEURYSM OF THE
AORTA

Just as sweat coming through the pores of the skin is so acrid in some that undergarments, even shirts, very shortly take on an odor from it, so the humours show the same trait when the true ribs become carious simply from an aneurysm of the ascending aorta. Twenty-two years ago I dissected the body of a man who for a long time had had in the chest an aneurysm of such great size that it equalled the head of a new born child, with a strong pulsation that smote the hand applied to the chest. When we opened the body we found an aneurysm in the great ascending artery one digit from the heart, as the accompanying figure represents. By the growth of this aneurysm the ribs were not only forced apart from each other, but, as we found, so corroded that they were lacking in great part, and what did remain could easily be resolved into a paste by rubbing with the fingers. When many years ago I related this case to the celebrated Van der Schagen, Doctor of Medicine, who was then alive, he told me that he also had seen caries of the ribs caused by pectoral aneurysm. It might indeed be more easily wondered at than explained how an enclosed aneurysm (that seems much like a dilated artery) can so corrode the ribs, if the following case had not come my way.

Explanation. Figure 38 [Plate II]

- | | |
|---|---------------------------------|
| A. Human heart. | F. Left ventricle |
| B. Pulmonary artery. | G. Portion of right ventricle. |
| C. Portion of the descending aorta. | H. Veins displaced by aneurysm. |
| D. Portion of the ascending aorta. | I. Coronary veins. |
| E. Aneurysm of the aforementioned artery. | |

OBSERVATION XXXVIII

A GIGANTIC ANEURYSM

Those authors who say that an aneurysm is a dilated artery, or one expanded beyond the laws of nature on account of a break in one of its coats, or a corrosion by the acidity of the humors with visible pulsation, do not depict the nature of this affection clearly enough. A description or definition of aneurysm in these terms is only true of many ordinary aneurysms; but more should be added

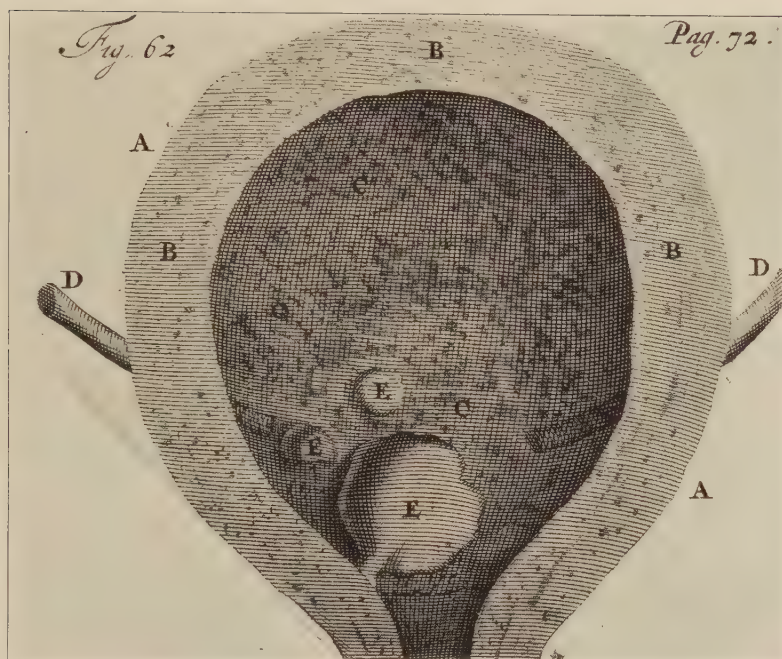


PLATE IO. TUMORS OF THE URINARY BLADDER. FROM THE "CENTURIA OF ANATOMICO-SURGICAL OBSERVATIONS" BY FREDERIK RUYSCH (1691-1737)



PLATE II. ANEURYSM OF THE AORTA. FROM THE
"CENTURIA OF ANATOMICO-SURGICAL OBSERVATIONS"
BY FREDERIK RUYSCH (1691-1737)

lest someone be further deceived in the curing of them. A definite pulsation cannot be felt in all aneurysms, in spite of the authors who would take that as a pathognomonic sign. If blood coagulates in an aneurysm no pulsation can be perceived. This once deceived a most learned surgeon, a great friend of mine during his life, who opened an aneurysm of this sort, the size of a walnut, not recognizing the tumor as an aneurysm because there was no pulsation. When he had opened this tumor and expressed the blood coagulated there, such a large hemorrhage commenced that it was stopped only with difficulty.

I have proved that no pulsation can be perceived in certain very large aneurysms. Recently, in company with the expert surgeon Dr. Willard, I called at the house of a soldier behind the market near the town commonly known as de Nes. This man carried in his chest an aneurysm of spontaneous growth of such an immense size that it equalled the cushions of the chairs on which we sat, with the four corners cut off, the aforementioned aneurysm being round. Many days before death occurred, it opened spontaneously in many places without much loss of blood, and, remarkably, the pulsation, which had been quite violent before, ceased some weeks before the opening occurred. This you may more easily believe, well-wishing reader, on learning that, after his death, I found this aneurysm (which originated from the aorta about three fingers breadth above the heart) to be laminated, so to speak, or composed of innumerable coats that were fatty, fleshy and tenacious enough, placed one next to the other. Among these coats a great deal of coagulated blood was concealed. The outermost of these, which was really the aorta, had the thickness of straw. Furthermore it is to be observed that almost all the ribs of the chest, as well as the sternum, were practically reduced to nothing, and almost the entire chest was denuded of them, as you may read in the preceding *Observation*. Thence came the difficulty of breathing, the slowness of mind, the continual fever, from which the patient had been suffering for several weeks. These remarks seem to bring some light for the explanation of caries of the ribs, since the blood, stagnating between those laminae and thereby becoming acrid, transudes little by little and slowly corrodes the bones. I judge this not to be feared in a simple expansion of the artery, from which we commonly believe an aneurysm arises, since stagnation and acridity are prevented by the constant inflow of new blood.

JEAN ASTRUC

(1684-1766)

OF THE many works on venereal disease published in the sixteenth, seventeenth, and eighteenth centuries one of the most elaborate and interesting is that of JEAN ASTRUC, a native of Languedoc in France and graduate of the nearby University of Montpellier. Astruc had a strong bent for pathological anatomy, and in fact published a "Tractus pathologicus" (1743). His greatest contributions to the development of pathology were in connection with the origin, growth and spread of malignant tumors, and with the etiology, nature and treatment of syphilis. Two selections from his "Treatise on the Lues Venerea" ("De Morbis Venereis Libri Sex," Paris 1736) are here included, both from the quaint English translation of 1754. The first delineates most clearly those events and situations leading to the common conception of the time that syphilis was a disease of New World origin. The second pictures Astruc's own views on the etiology of the disease, and gives the current description of its anatomic nature and progression. It is obvious from reading this that a clinical separation had not yet been made between gonorrhoea and syphilis. It is noteworthy that while Astruc was aware of some of the internal manifestations of the "lues venerea", particularly in the bones, the characteristic vascular lesions, on which stress is laid today, quite escaped him, and this in spite of the fact that many previous writers had drawn attention to the possibility that aneurysms and other lesions of arteries were of venereal origin.

THAT THE VENEREAL DISEASE IMPORTED FROM HISPANIOLA, WAS PROPAGATED FROM THE SPANIARDS TO THE NEAPOLITANS, FROM BOTH TO THE FRENCH, AND FROM ALL THREE TO THE OTHER EUROPEAN NATIONS, AND MOST OF THE PEOPLE OF ASIA AND AFRICA; THOUGH UNDER THE TORRID ZONE THERE ARE SOME COUNTRIES, WHERE IT SEEMS TO BE A NATIVE AND ENDEMIAL DISEASE.

At the Close of the fifteenth Century, Ferdinand and Isabel jointly reign'd over Spain. Isabel was Queen of Castille and Leon; and Ferdinand by hereditary Descent enjoyed the Kingdoms of Arragon and Valencia; he was also Master of Sicily, which Peter III. King of Arragon, whether justly or otherwise, I do not here en-

quire, but certainly by very bad Means had formerly acquired, the French being cut off to a Man by that most black and perfidious Action, which is to this Day infamous in History by the Name of *the Sicilian Vespers*.

Ever since the Death of Lewis XI. this Ferdinand and Charles VIII. King of France had mutually claimed the Countries of Roussillon and Cerdagne: but Charles thought fit to patch up a Peace in 1492, that he might meet with no Obstacle in the Expedition he prepared against Italy, by which he sought to recover the Kingdom of Naples by open force, as due to him by Inheritance upon the Death of Charles, Count of Maine. A Treaty therefore was made at Narbonne in January 1492, or rather 1493, according to our present Computation, by which it was expressly stipulated, that Ferdinand should declare against whosoever should make War upon the King of France, and on this Condition Charles gave up to Ferdinand the Counties in dispute.

But though the Conditions of the Treaty were thus favourable to Ferdinand, he notwithstanding kept not his Word, nor ever desisted from aiding the Kings of Naples, with whom Charles was at War. They were indeed descended of the Kings of Arragon, and nearly allied to him in blood, though sprung from a spurious Branch; but Ferdinand was guided by other Motives. He feared lest the French, if quietly possessed of the Kingdom of Naples, should turn their Eyes upon Sicily, and recover it out of his Hands.

With these Views Ferdinand, as he was a great Master of Craft and Subtilty, was constantly employed in privately assisting the Kings of Naples with his Advice and Forces, or in opposing the Progress of the French, by secretly raising them up Enemies, or diverting their Allies. At last, when Charles, by greater Fortune than could have been expected, was entering victorious into the Kingdom of Naples, Ferdinand threw off the Mask, and ordered his Ambassador Antonio de Fonseca to bid him desist in his Name from his unlawful Usurpation, for so he termed it; which was done by the Ambassador at Velitri, not far from Rome, on the 29th of January 1494, with so much Insolence, that when Charles objected the Articles of the Peace made at Narbonne, he made no Scruple publicly to tear them in pieces.

From this Time France and Spain warred openly against each other. Ferdinand had already sent an Army into Sicily under the Command of Gonsalvo Hernandez of Corduba, who from thence

was called the Great Captain. Hither came Ferdinand II. (who, upon his being deprived of the Kingdom of Naples, had retired to the Isle of Ischia) a little before the Departure of Charles, to consult with Gonsalvo. And from hence, within a few Days after Charles had left the Kingdom, they both made a Descent upon Regio with six thousand Men, and from thence made themselves Masters of the neighboring Towns and Provinces. The Event of the War was long doubtful, till at length Naples revolting, the neighbouring Garisons starv'd into a Surrender, and the Count of Montpensier, who was left Governor of the Kingdom, dying, the French were forced to quit the Country by Agreement the End of the Year 1496, as we have already observed in Chap. V.

In the Neapolitan, or rather in the Spanish Army, there were not a few of the Soldiers, who returning from the Indies, either in the first Voyage with Christopher Columbus in the Month of March 1493, or in the second with Antonio de Torrez in the beginning of the Year 1494, or in the third with Pedro de Margarit at the end of the same Year, were as yet infected with the Venereal Disease, or at least had contracted it in Spain, after it had been brought by others into Europe. And therefore it is by no means strange, that many of the Neapolitans should be infected with the same Dis-temper, as they served under the same Colours, and had to do with the same Women, who followed the Camp. And for the same reason the like Contagion could not but soon be communicated by one or both of them to the French; for as the Success of the War continued doubtful for two whole Years, and the same Towns were taken and recovered by both Parties, 'tis plain, that the French also must have had Communication with the same Whores, who had lain with Spaniards and Neapolitans, and thus the Seeds of the Venereal Disease must have mutually passed from one to the other.

But that no one may imagine this is founded on bare Conjecture, we shall produce an undeniable Witness, Gonsalvo Fernandez ab Oviedo, who was at Barcelona at the Court of Spain in 1493, when Christopher Columbus first returned from the Island of Hispaniola, after having discovered it; who was particularly acquainted with several of Columbus's Companions, or others who returned from the West-Indies in the Years following; who had frequently heard from them whatever had passed in their first Voyages; who in 1513, was sent into Hispaniola by Ferdinand, King of Spain, to inspect the melting of the Gold and Silver dug out of the Mines there; and

lastly, who either in Person saw and observed whatever passed at that Time in Spain, Naples, and the Island of Hispaniola, or learnt it from Eye-witnesses.

In the *Summary of the Natural and General History of the West-Indies*, which upon his returning to Europe from Hispaniola, where he had liv'd twelve Years, he wrote in Spanish at Toledo in 1525, he thus addresses himself to the Emperor Charles V. King of Spain, by whose Direction he compiled this Work:

"I can assure your Imperial Majesty, *says he*, that this Disease which is new in Europe, is well known in the Antille Islands lately discovered, and so very common there, that almost every one of the Spaniards who lay with the Indian Women contracted it from them. Thus it was imported from thence into Spain, by those who returned with Columbus after his first or second Voyage. And afterwards in the Year 1495, when Gonsalva Fernandez of Corduba, at that time a famous General, marched the Spanish Forces into Italy, by Order of their Catholic Majesties Ferdinand and Isabella, to the Assistance of Ferdinand II. King of Naples against Charles King of France, who from the Largeness of his Head was called Great-Head, there were several of the Spanish Soldiers infected with the same Disease; and thus it was quickly communicated to the Neapolitans and French, by Means of their lying promiscuously with the same Whores."

To the like Purpose the same Author writes in his *Natural and General History of the West-Indies*, Book 2. Chap. 14. which is a much larger Work than his Summary, and written in Spanish ten Years after, viz. in 1535. There he expressly names several eminent Witnesses, who beheld what passed, and were concerned in the first Expeditions made into Hispaniola, and from whom he declares he received whatever he relates. And more especially he relies upon the Authority and Testimony of Pedro de Margarit, the Catalonian, whose Testimony is of the greater Value, as he attended upon Christopher Columbus in his second Expedition into Hispaniola in 1493, and returned from thence in the Year following infected with the Venereal Disease, of which the Author suspected he was not perfectly cured at the Time he wrote, because he was even at that Time tortured with continual Pains. Upon a thorough Knowledge therefore of the Fact, this Author expressly maintains, that the Venereal Disease was brought from Hispaniola into Spain before the Year 1495, by the Spanish Soldiers who served under Gonsalvo

Fernandez in Italy, and communicated to the French and Neapolitans by promiscuous Venery.

To come then nearer to our Purpose, the three principal Nations in Europe being by this Means infected, the Contagion could not but soon spread itself through the rest, by reason of the mutual Commerce kept up amongst them, which was farther promoted by the state of Affairs at that Time, as the Germans and Dutch were then subject to the same Lord, viz. Charles V. with the Italians and Spaniards, as the French were then strictly united with the English, and lastly as Lewis XII. was continually at War with Ferdinand the Catholick and Francis I, with Charles V. both by Sea and Land; all which Circumstances must have considerably quickened the Propagation of this Disease.

Thus it appears, that the Venereal Disease spread itself from Castille into the Confines of Portugal, and was there named the *Castillian Disease*; and in the Year 1496, upon the Marriage of Jane the Daughter of Ferdinand and Isabel, with the Archduke Philip, it was by the same Castillians transported into the Low-Countries, and there it was called the *Spanish Disease*, as we learn from Beverovicus, *Idea Medicinæ veterum*, Part. 3. Chap. 8. In like manner it was carried over from France into England, where it is named the *French Disease*, or *French Pox*, and as the Contagion came chiefly from Bourdeaux, it was formerly call'd there the *Bourdeaux Disease*.

But though this Disease appears to have spread itself very quickly from Spain, Italy, and France, where it first began, into the other Countries of Europe, yet its progress was gradual, and slower in Proportion to the Distance of those Countries from the Places where first it shewed itself. Of this we have the Testimony of Daniel Sennertus about the Year 1632, concerning the upper Saxony, who in the sixth Book of his Works, Part. 2. Chap. 1. after relating that Capivaccius in Italy had got above eighteen thousand Crowns by the sole curing of the French Disease, ingeniously owns, "that for thirty four Years, during which Space, by the Blessing of God, he had practiced Physic not without Profit, he had not made so many single Crowns by curing this Disease, as Capivaccius had made thousands, owing to the small Number of those who laboured under it in that Country."

However, at the same time that the Infection of the Venereal Disease passed from Spain into Italy and France, and from thence

into the other European Countries, it appears likewise, to have spread itself along the Coasts of Asia and Africa, that were adjacent to the Mediterranean Sea.

OF THE NATURE OF THE VENEREAL POISON

We have seen in the foregoing Chapter, that the Venereal Disease in Europe is propagated solely by Infection. There are therefore conveyed from the Diseased into the Sound, certain Seeds of morbid Matter, which being introduced into a healthy body in the smallest Quantity, and by insensible Passages, and gradually increasing in Bulk, Form and Efficacy, sooner or later are able to infect and corrupt the whole Mass of Humours. And these Seeds of the Disease are usually, and not improperly, named the *Venereal Ferment, Venom, or Poison*.

This Method of Propagation is not peculiar to the Venereal Disease alone, but common to all other contagious Distempers. So the Small-Pox may be communicated by taking a small Portion of corrupted Matter out of the Pustules, and applying it to an Incision made in the Skin; the Plaque, by Matter flowing out of the Buboës, and dropt into a Wound made in any Animal; the itch or Tetters, by the Ichor discharged from a diseased Skin, and adhering to a sound one; the *Hydrophobia*, by the Admission of the *Saliva* of a mad Dog into the Part that is bitten; the Indisposition occasioned by the *Tarantula*, by the Humour which that Spider conveys by its Bite into the Skin, as by so many Ferments peculiar to each Disease.

But as in different Ferments there is a different Nature, whereby they are enabled to bring on the several Diseases they occasion, so must the Venereal Venom have its peculiar Disposition, which is by so much the more noxious, as the Disease it produces is more grievous than others, and which therefore it the more concerns us to be acquainted with, as we may thereby apply a more certain Remedy to these Disorders, which it causes. Our Enquiry into its Nature would be to no Purpose, if that was to be determined by a chymical *Analysis*, or the mixing of it with other known Liquors, as Experiments of this Kind never can be made, or if they could, would not be safe, or fit to be relied on; we have therefore only one unexceptionable Rule of Judging left, and that is drawn from the known Effects of the Venereal Poison, from whence we may successfully arrive at the Knowledge of its peculiar Nature and Property.

I. Therefore the Venereal Poison brings on a Redness, Heat,

Tension, Pain, in a Word, an Inflammation upon the Parts which it affects. So in a *Gonorrhoea* the *Urethra*, the *Prostatae*, and the *Vesiculae Seminales*, are observed to be inflamed in Men; and in Women the *Vagina*, the *Pudendum*, the *Prostate*, and the *Glandulae Cowperianae*: So in Chancres in Men, there is an Inflammation of the *Glans*, the *Fraenum*, and *Praepuce*: and in Women, in the *Pterygia*, the *Carunculae Myrtiformes*, and the rest of the *Pudendum*: So in a Bubo the inguinal Glands: In a Node the *Periosteum*: And lastly, every other Part of the Body, upon which the Poison seizes, is subject to an inflammation. The Venereal Poison is therefore of an inflammatory Nature, that is so disposed, as by condensing and crisping the membranous *Stamina* of the Parts it penetrates, and by that Means constringing the Extremities of the Vessels interspersed, to force the Blood from its usual Course into the contiguous lymphatick Vessels, from whence arises an inflammation.

II. The Venereal Poison, if left to itself, by little and little corrodes, exulcerates, and preys upon the Parts, which it has once inflamed. So in a *Gonorrhoea*, the *Urethra*, *Prostatae*, and *Vesiculae Seminales* are eroded and exulcerated in Men; and in Women the *Prostatae*, *Cowper's Glands*, and the *Vagina*: So in Ulcers of the *Penis*, the *Glans*, the *Fraenum*, and *Prepuce*; and in Women, the several Parts of the *Pudendum*: So in a Bubo, the inguinal Glands; in Nodes, the bony *Lamellae* and *Periosteum*; in Ulcers of the Palate and Nostrils, the *Uvula*, *Tonsils*, the *Membrana Pituitaria*, the quadrangular Bones of the Palate, the *Vomer*, the bony *Lamellae* of the Nose, etc. are eroded and exulcerated. The Venereal Poison therefore consists of Particles of such a Figure, Size, and Mobility, as to be able to divide, break, and dissolve the *Stamina* of the Parts it falls upon, which it had before constringed, crisped, and inflamed, whence arises an Erosion and Exulceration.

III. The Venereal Poison in the Parts, which it touches and erodes, produces indurations, scirrhus and callous Tumours. So in a *Gonorrhoea* in Both Sexes, the *Prostates*, the *Vesiculae Seminales*, or Glands of the *Vagina*: In Ulcers of the Genitals, the Lips of the Ulcers: In a Bubo, the inguinal Glands: In Pustules, their Basis and Circumference: In Nodes, the external Part of the *Periosteum*, and the Filaments interspersed between the bony *Lamellae*: So the Glands of the Mesentery, the Lobes of the Liver, and the lymphatick Vessels of the Lungs, are found to grow hard, scirrhus, or callous.

The Venereal Poison therefore must be of such Efficacy, that if it cannot divide and exulcerate the *Stamina* of the Parts upon which it falls, it can at least by inspissating the lymphatick Humour harden them into Calluses of different Forms.

Lastly, the Venereal Poison is never propagated at a Distance, but only by immediate contact; nor is every slight, momentary Contact, in the hard, callous, or cold parts, able to convey it; but to this Purpose there is Need of a more lasting Contact, attended with Heat and Rarefaction in soft and spongy Parts, as is plain from what we have already said in the preceding Chapter, concerning the Ways of propagating the Venereal Disease. The Venereal Poison does not therefore consist of fine, light, volatile, and penetrable Particles, which may be dispersed in Air, or carried to a Distance, or speedily pervade the closest Pores, but of Particles that are gross, heavy and fixed, which cannot be communicated, unless they are exalted by Heat, unless the Parts exposed to it be soft and permeable, and an immediate and lasting Contact intervene.

GIOVANNI BATTISTA MORGAGNI

(1682-1771)

WITH THE publication of the "*The Seats and Causes of Disease*" by GIOVANNI BATTISTA MORGAGNI in 1761, the science of pathology entered upon a period of new and great development. A native of Forlì in Romagna, Italy, Morgagni studied medicine in Bologna, where he came under the influence of the able anatomist Valsalva. As assistant to the latter, and for a time successor, he enjoyed an enormous early experience in pathological anatomy, which prepared the way for his distinguished career as professor of anatomy at Padua, which position he held the major portion of the period from 1712-1771. The secret of Morgagni's ultimate greatest distinction lay in his early appreciation of the importance of accurate correlation of the symptoms of disease and the pathological anatomy of fatal cases as observed by post-mortem dissection. In his youth the standard text of pathological anatomy was the "*Sepulchretum Anatomicum*" of Théophile Bonet, an enormous collection of necropsy reports from the sixteenth and seventeenth centuries, the individual brevity and obvious inaccuracy of which, in addition to their defective correlation of symptoms and organic lesion, left Morgagni profoundly dissatisfied.

Intending originally simply to supplement Bonet's great compilation, Morgagni commenced a written record of observations of his own and his master Valsalva, putting these, as was frequently done at that time, in the form of correspondence with a friend. Collected and reëdited, these were published in five books and a total of seventy chapters, under the title "*De Sedibus et Causis Morborum*," a work with few rivals in its effect upon the development of medicine. In this he reported the results of about seven hundred necropsies performed by himself, Valsalva, or other friends and associates. In the case of many of these the clinical features are described with the utmost detail. Extensive reference to pertinent observations of predecessors testifies to a familiarity with the written records of the subject as great as that of Bonet. The whole span of pathological anatomy is covered, and it is difficult to select parts which are outstanding. The delineation of diseases of the heart and blood vessels is perhaps most notable. The following selections illustrate his

*care in objective description, and aside from their pathologic import, indicate the wide social range of Morgagni's subject material for study.*¹

Selections from *The Seats and Causes of Disease*

To begin with a great man; whose history is for that reason more accurately described by Valsalva: The Cardinal Antonio Francesco Sanvitalis was of a moderate stature, or somewhat taller, of a full fleshy habit, and a florid colour: he had been much given to study and close application; was also subject to the gout, and had some years before been attacked with a certain ineffectual irritation of the fauces, to spit: and beside this, he was also troubled at intervals, with convulsive motions in his feet and hands. Finally, when he was five and fifty years of age, having lived for two months together in a mountainous country, on which the south winds generally blew, and the air of which he had at other times found extremely inimical to him; and being also troubled with cares and anxieties of mind, and the winter solstice of the year 1714 being at hand, he fell into a vertiginous disorder; after which, although he was freed therefrom, he shewed a constant sadness, and propensity to sleep. Within about twenty days the vertiginous disorder returned, and brought a vomiting with it. Yet both these were in a short space removed, and after that a violent pain of the head, which had succeeded them. But the day following, at the same hour on which the vertigo had seized him, all sense of feeling and power of motion was lost in the left part of his body, and he lay as if overcome with a profound sleep. His respiration, however, was natural; but his pulse frequent, large, and vehement; and though it was in vain to irritate the left limbs, yet the same irritations being applied to the sole of the right foot, and the usual ones to the nostrils, he was somewhat roused, so as to say many things by signs, and some even by proper words. But these irritations had a happier effect after blood being taken away; more especially on the sixth day from the apoplexy, when the right jugular vein was opened by Valsalva's order; for about four hours after, his internal senses were awakened; and his speech, for more than an hour, was restored. The same change happened, about the same hour, on the following night, and was more evident, and of longer duration. But this rousing was his last: for from that time he gradually declined; and was seized with convulsive motions on his right side, especially in his hand and foot: his whole face was

¹ From the translation by Benjamin^{*} Alexander, London 1769.

likewise convulsed, but especially about his eyes, and perhaps the heart itself; for he frequently at the same time lay entirely without pulse. In fine, these symptoms recurring about the beginning of the tenth day, he died.

In the belly and chest every thing was found in a natural state. The brain, however, was flaccid; and in the left ventricle was a little serum; but the right contained more than two ounces of coagulated blood. The plexus choroides was here torn through, and the parietes of the ventricle, even on the external side, toward the back part, were corroded into the form of a deep ulcer.

Many things concurred to dispose this great man to an apoplexy: studies, close application to important businesses, anxieties of mind, and even the gout itself, which often draws after it a calculous, and at other times an apoplectic affection. In reading histories of this kind, please to observe, among the rest, those of a prince, and a count, both of whom were gouty, both apoplectic: and besides cystic calculi in each, the lateral ventricles of one were full of serum; but those of the other, which is more to our present purpose, were full of extravasated blood. Many of these common signs which Caelius Aurelianus formerly collected, foretold the apoplexy of the cardinal, to wit, the convulsive motions of the hands and face; and even, as I think, the convulsive motion of the fauces too: next to these, the repeated vertigoes, which were followed by a proneness to sleep, sadness, and a violent pain of the head; which so far proclaimed the approach of an apoplexy, that the last vertigo may be in some measure taken for a kind of slight apoplectic paroxysm, inasmuch as a more heavy one succeeded it on the following day, at the same hour. That this apoplexy was sanguineous, the quantity of blood, demonstrated by the florid colour, might have shewn, as also the rarefaction brought on by the south winds; the vessels, now growing rigid with age, being presently streightened by the winter, and on both these accounts made easily liable to rupture. Nor yet was the apoplexy violent in its beginning or progress; as the natural respiration, and the power of feeling and moving, not being wholly taken away, even on the left side, concurred to shew. This was also testified from the speech, together with the internal senses, being once, and again, and even a third time restored; till at length, a laceration in the brain being encreased, and the blood more effused, the disorder became fatal. Nor was the febrile pulse of the least advantage, though it attended from the

very beginning of the disorder: nor yet the fever itself, if you will allow me to suppose what, I think, the remission and exacerbation, sometimes observed at the same hour, did in some measure shew. I will even venture to say, that it was of great disadvantage, by strongly agitating and impelling the blood: so that among the many and various things given out by the interpreters of Hippocrates, and other ancient as well as modern physicians, of a fever succeeding an apoplexy, this seems to claim the first place here, that although, in the serous apoplexy, it may sometimes be useful, yet it is rather hurtful in the sanguineous; and the very experienced Werlhof has affirmed, that an apoplexy is rarely solved by a succeeding fever. But on the other hand, blood letting had all the advantage it could possibly have, especially from the jugular vein; and that the right too, as Valsalva, who flew from Bologna to the cardinal, has laid down as a maxim, taken from his observations on patients afflicted with a hemiplegia, and as dissection also at that time confirmed. For the mischief was in the right side of the brain, whereas the left side of the body was resolved; which you will find was also the case in the dissections that follow.

* * *

A woman, of about sixty years of age, had laboured a long time under a cough, and a difficulty of respiration, which was not continual, but most observable after violent motion. At length a pulsating tumour began to appear, under the right clavicle at the sternum; which, in the space of two or three months, increased to such a degree, that one head of it seemed to have risen, as it were, out of the middle of the sternum; for it was extended from thence, almost in a globular form, to the neck. In the tumour was a sense of heat, and burning pain. In the mean while, those former inconveniences were much increased, and others were added over and above. For from the middle of the upper arms to the hands, and from the upper part of the legs, almost quite to the feet, her limbs were all over oedematous, which was so much the more remarkable, because, as the upper arms were much extenuated, from the upper part quite to the middle, at that part, of a sudden, began this immoderate thickness; which circumstance might also be observed in the legs, though not so evidently, when the upper parts of them were compared with the neighboring parts. The face also had swelled a little. She had a frequent spitting, and on the last days,

it was almost purulent. The pulse was weak, and small. She had no rest, unless when she sat up; for any even slight motion, and not only lying down on her back, threw her into instant danger of suffocation. The same effect was produced from the taking of food, or drink; so that she was at length constrained to abstain entirely from both. Wherefore, having abstained six days, she was carried off, rather from being starved with hunger, and from slight convulsive motions, than from the disease.

In the belly, a limpid serum stagnated. The liver and the stomach were found to be placed lower than usual. The colon did not go from the right side to the left, but when it had touched upon the bottom of the stomach, it went from thence immediately, through the middle of the belly, to the rectum. The faeces of the belly, not having been discharged of a long time before death, were almost all contained within the beginning of the colon. A gland lay upon the left kidney, externally, of the bigness of a chesnut, and internally of a yellowish colour. In the thorax serum stagnated, which was drawn out with sponges. The left lobe of the lungs was very much contracted, and in a manner inflamed, and in the middle contained a sanious ichor, and here and there little tubercles, some of which were suppurated. The pericardium abounded with serum. The heart, being placed somewhat lower than usual, and almost wholly in the left side, was twice as big as it naturally is, nor yet contained any polypous concretions. But the aorta had a large and oblong aneurismal sac produced from it. The orifice of this sac communicated with the artery, at the superior, and somewhat anterior part of its curvature, in such a manner, that the common trunk, also, of the right carotid, and subclavian, being dilated into that sac, these two arteries came forth from the posterior surface of its beginning. And as the sac became more wide, the more distant it was from the orifice. First, indeed, it compressed very much the interior parts of the thorax, and among these the *aspera arteria*, and oesophagus: but after that, having consumed away the anterior bones of the thorax, and especially the right clavicle, and such of the ribs as were nearest to it, and the parts of the sternum, by its continual pulsation, and by an eroding humour that was discharged therefrom, it had prepared a way for itself to the external parts, and raising up the muscles and integuments, had made that figure, as I called it, of another head. But these parts, which it had carried out with it, had, by lying around the sac, prevented the blood from

being easily poured out from the ruptured aneurism. For the external coat of the artery, the more it receded from the trunk, being so much the more extenuated, could scarcely be any more known, or perceived, when you came on the outside of the thorax. And the internal coat itself also, in the trunk, preserved its natural state; yet presently seemed to consist even of three membranes, each of which seemed to be subdivided into others, but pretty thick ones, and in a manner fleshy, and which, if they had been more firm, would have almost represented a muscular body, the tendon of which was to be supposed in this internal coat, where it came out from the trunk. Nevertheless, these fleshy kinds of membranes, which made up the internal coat of the sac, and which, in some places, were equal in thickness to a finger's breadth, in other places were lacerated, and eroded; so that unless either the external coat, or the parietes of the parts that lay round about, had prevented it, the blood must have burst forth from thence. As to what remains on this subject, a grumous blood was contained in the cavity of the sac.

The limbs, also, that were oedematous, were dissected; and no serum was found betwixt the muscular fibres: but the whole of it seemed to be shut up betwixt the skin and the muscles, in the dilated cells of the adipose membrane. And it was easily supposed, that in those parts of the limbs, which I spoke of, this serum had stagnated, by reason of the impulse of the blood through the arteries being debilitated, and for that reason not able to carry it upwards; for, certainly, those parts of the limbs that were nearer to the heart, by no means swelled, as I have already said. This serum being pressed out from the arm, in many places, by the incision of the skin, resembled water in its colour; and when put upon the fire, did not at all become turbid, but evaporated away wholly. But that which had been taken from the thoracic cavities, approaching in its colour to a saturated yellow, not only became turbid, but a little after had a pellicle upon its surface, which, as the evaporation constantly went on, it at length left in the bottom of the vessel.

As to the serum that was drawn out from the belly, although it was like the first in colour, and although it evaporated away in the same manner as the second, yet it by no means became turbid. Moreover, as a portion of each was not committed to the fire, but kept separately in glass-vessels, and although the second, in a short time, shewed many concretions of a membranous form, swimming

in the middle of it, like those which frequently appear in wine, yet the first and third exhibited very few only.

* * *

A native of Beluna, in the territories of Venice, who was about fifty years of age, and whose business was to shear woollen cloth, with shears that were pretty large, indeed, but not the largest, and most heavy, began a year before to have a tumour arise in the right and upper part of the chest, whether drinking, to which he was much addicted, gave occasion to it, or the venereal disease, or rather both of them together, being added to the business in which, as I have said, he continually exercised himself. For what inconveniences had preceded, or what had afterwards succeeded, it was not in my power to know, except that at least, from the time he returned to Venice, which was about the beginning of October, in the year 1707, he was troubled with a difficulty of breathing, whether he walked or spoke; which, however, neither attacked him by paroxysms, nor threatened suffocation, nor broke his sleep; and this would have been readily referred to the man's trade also, especially by those to whom the experiment made by Kerckringius, in the shop of some artists of this kind, was known and approved. But besides this, he could now eat and drink but little. His face was tumid, and of a brownish red; his voice obscure and hoarse; his spitting thick; and the pulsation of the tumour was sometimes seen, or at least before the last twenty days, was very evident, even at a distance. This man, about the beginning of the December following, having spent the former part of the night among his fellow-servants, according to custom, and having talked with them, went at length to bed, saying that he should soon go to sleep; but a little after, he was found in a dying condition, with a stertor, and a foam at his mouth and nostrils; and thus within about four hours he died.

The face of the body was turgid and livid; the hands and feet not tumid; but the praeputium and the glands were swelled, livid, and had a putrid smell, as if they were inclined to a gangrene; but when Santorini and I would fain have examined the urethra, neither time, nor place, nor, perhaps, the persons who were present permitted us. Wherefore, the belly being opened, and the liver, and the spleen, being observed to be pretty hard, and the latter of these viscera also to be larger than the natural size, our whole attention was

turned towards the thorax. And, externally indeed, in that part of the chest which lies between the right axilla and the sternum, a tumour was prominent, of a hemispherical figure, but depressed, reaching from the fourth rib, to the clavicle, but nearer to the sternum than to the axilla; if you pressed upon it, it yielded, so as immediately to show you that scarcely any bones, or cartilages, now remained; which, in that part, naturally lie betwixt the muscles, and the cavity of the thorax. And, indeed, we found the clavicle to be displaced, and corroded, internally, with a caries; and that part of the four upper ribs, in particular, which used to continue long cartilaginous, we found to be corrupted, or consumed by the aneurism, the magnitude of which exceeded that of a kid's head: the figure of the tumour was nearly oval, and the seat of it was extended from the basis of the heart, to the upper part of the thorax. But the aneurism was like a sac, the left side of which, by a foramen that admitted two fingers, communicated with the right side of the aorta, before it gave off the common beginning of the right subclavian, and carotid arteries. This sac seemed to be formed of the produced substance of the aorta, but was more white, tenacious, and dense, and not less thick. This substance was internally invested with many curved laminae, folded one within another, seemingly fibrous, and really polypous, but without moisture: and these laminae contained such a quantity of blood, within their circumference, and this almost concreted, that being taken out from the cavity, together with those polypous laminae, and put into the scales, it weighed forty ounces. The aneurism, by its bulk, had driven the right lobe of the lungs backwards, and more downwards than usual; so that it seemed to be made less by the compression. This lobe being cut into, a white pus was seen to come forth, here and there, from the bronchiae that were cut asunder. The left lobe was sound. Yet in each cavity of the thorax, but more in the right, was a quantity of yellowish serum, which had a kind of mucous pellicles mixed with it.

The pericardium also adhered to the heart, on all sides, by a mucous, and yellowish substance of that kind. In the right auricle of the heart, and its annexed ventricle, was a polypous concretion: in the pulmonary artery was blood: but in the left ventricle, neither one nor the other. Finally, the aorta descendens was internally unequal in some places, and had marks of ossification, beginning, as it were, by a kind of tendinous hardness.

A nobleman, who was not far from the age of fifty-nine, of a black complexion, but of a good habit of body, notwithstanding he had been much given to venery from his youth quite to that time, from whence he had been more than once troubled with buboes, made use of gross and common food, but drank generous wine and spirituous liquors with great freedom. He also played much at dice: and it was related by his comrades at play, that he was used to be seized every day in the evening with a sneezing; so that he sometimes sneezed a quarter of an hour, or more, and that for two or three years. At which time he also began to be emaciated, and not in a small degree neither, and to be affected with a kind of internal sensation, just as if, according to his own expression in the last months of his life, he was about to faint away. Yet he would use no other remedy, in order to recover himself, but the same spirituous liquors I have mentioned. Wherefore, returning home one day about evening, and having drunk once or twice of these spirits, and his domestics having supposed that he had afterwards gone out of the house, it there happened that he died suddenly, without any body knowing of it: and at length, after the fifth hour, his body, as it was winter, was found quite cold.

The cranium being opened the day following, and the meninges, for the whole of the pia mater also every where followed the hand that drew it, being easily removed, nothing was found within that had a preternatural appearance, except a great quantity of serum in the ventricles of the brain, and that of a greenish colour. But in the pia mater all the trunks of the arteries, and, in like manner, all their branches, and especially those which go towards the plexus choroides, were much more thick and hard than is natural, and when dried showed in many places a bony nature. And, indeed, nearly the same thing was seen throughout the dura mater in the arteries thereof, which were themselves also become somewhat thick.

But in the thorax the lungs were flaccid, and, in the greater part of them, black. The left lobe was besides every where closely connected to the pleura, where it invests the ribs and diaphragm, except where some quantity of coagulated blood was observed. There was a much greater quantity of this blood in the pericardium, wh ther it had burst, as I shall say presently, from the great artery. The heart was somewhat larger than it naturally is, by reason of the too great magnitude of the left ventricle, and the capacity of it, which exceeded that of the right ventricle by two-third parts;

whereas this last mentioned cavity, besides the great thinness of its proper parietes, had fasciculi of fibres on its inside, so entangled with each other that it scarcely seemed to be a sinus. The aorta and the pulmonary artery were somewhat larger than they generally are. The latter of these vessels, however, was sound; but the former was first ruptured at the distance of about a finger's breadth from the heart. Yet this rupture was not large; but near to it, and round all the basis of the aorta, a kind of blackness, as if from an old bruise, appeared, which was owing to black blood stagnating under the external coat; and this blackness extended itself through the lungs in general, but particularly about the larger branches of the pulmonary artery. Besides this, the whole internal surface of the great artery was universally full of prominences and pustules, both of which were continued through all the branches of it that were laid open, and particularly through the subclavian arteries, the carotids, and the coronaries of the heart itself: the last of which were, moreover, very much dilated, and one in particular, so as nearly to equal the breadth of the left carotid.

In the belly the spleen was small, and very lax, although the liver was pretty sound, and in every respect natural; for as to there being but a very small portion of bile in the gall-bladder, that was, perhaps, owing to his having died but a few hours after dinner. The kidneys were very flaccid externally and internally, which is very rare, without any pelvis, the place of these being supplied by a kind of spongy substance.

As, within the belly, there was nothing besides these appearances worthy of remark; and as it was no secret, that the patient had been, more than once, affected with a lues venerea, as I have said, and that a leaden bullet from a pistol had been lodged in his left thigh thirty years before; the urethra and the left thigh were cut into. And in the former, one or two, and no more, of the orifices of those small canals, which I have described in the first of the *Adversaria*, and of which a representation is there given, were found. And in the thigh was a membranous follicle about that bullet, with which it was streightly inclosed all round.

Having seen these appearances, I had a mind to take out a good part of the aorta, in order to examine it more accurately, on the inside, and on the outside. And it was observed, that the external coat could be easily drawn away from the trunk and branches thereof, just as if it had been, for a long time, macerated in water. And when

any one of the larger of these internal prominences was cut into, it showed, internally, a kind of cavity; and in this cavity was a little softish matter, like a pultice. But many of the smaller ones appeared bony after they were dried.

* * *

A strumpet, of about twenty years of age, had laboured many months under a slow fever, a cough, an ill-conditioned expectoration, and a wasting of the whole body. She complained of a pain in the left part of the thorax, so that she could scarcely bear to lie down upon it. She was troubled with a difficulty of breathing. To which was added a copious spitting of blood: but this being checked, and two days after a south wind blowing hard, in which state of air those who labour under a similar disorder, for the most part, perish, death put an end to her disease.

The right lobe of the lungs adhered very little to the ribs. Both of them abounded with hard tubercles, which inclined to a white colour, and resembled glandular bodies. Besides, the upper lobules of the lungs, on both sides, had other disorders in that upper part. For the right lobe, towards the sternum, contained a large hollow ulcer, and in this a purulent matter; but the left, towards the side, contained a hard substance, equal to the bigness of a large pear, which, in some measure, resembled the substance of the pancreas, when indurated; and in the middle of this substance was a small ulcer, full of pus. In the pericardium was a small quantity of serum: in the left ventricle of the heart was a small polypous concretion, in the right was one of a moderate size, the greater production of which was inserted into the neighbouring auricle.

* * *

A hanged man had the sternothyroidaei, and hyothyroidaei muscles torn, so that only a membranous substance remained in their place, about the annular cartilage. And this very cartilage was also broken asunder. In the left cavity of the thorax, the pleura was, here and there, unequal, with many, and hard, tubercles; some of which were equal in size to a lentil, some to a vetch, and others to a bean.

These tubercles were owing to a disease, which was easily contracted by the noisomeness of a dungeon. For I have made a remark, relative to this very man, whose body I dissected, together with

Valsalva, in the college at Bologna, in the year 1703, that he was almost a year in prison, and that, besides these tubercles, almost of a cartilaginous hardness, which beset, nearly, the whole pleura, on that side; he had the left lobe of the lungs also, in some places, pretty hard, and in the same cavity of the thorax, a small quantity of reddish humour. And from what cause it happens, that scarcely any of those who are long detained in a prison, ever come out healthy from thence, the Sepulchretum itself takes notice, that is to say, from the constant bad air, and often, even the provision, continual grief, and an inactive life, which although it renders some of them fat, yet I cannot approve of the use of such fat, but of that which is prepared from a man, who is accidentally killed, when in good health.

* * *

Now I will pass over from this kind of epidemic inflammation of the lungs, which raged at that time among the poor at Bologna, to another at Padua, which spread about in the winter of the year 1738; and no where more than in some convents of nuns, and especially in one, to such a degree, that all who were seized with it died, and some even within four days. Which was the reason, without doubt, that, as nine had already died, I was publicly commanded to enquire into the nature of the disease, even by dissection. It was not difficult to conceive, that there was nothing contagious in it, as none of those who had attended upon the sick had contracted the disease, and even they, who had taken the most care to keep themselves from them, were seized with it; but not without a peculiar cause, and disposition, in almost every one. One of them, for instance, had had an ulcer of long standing in her leg, which was now healed up; another had had a previous fall upon her chest, and had spit a great quantity of blood in this last sickness; another had been long inclined to a pulmonary phthisis; and in fine, others had other causes to render the powers of the thorax and lungs infirm, as they who were of a decrepid age.

But nevertheless, although out of those who had been ill at that time, notwithstanding three different physicians had been employed, some having been attended by one, and some by another, not one could be saved, as I have said; yet by many this was not ascribed so much to the violence of the disorder, as to its nature not being well known, and especially by the inhabitants of the convent. And by what means I extorted this judgment from them, you will

know from the subjoined history. For when the tenth was now dead, and those physicians and I came together to the dissection of her, I begged of them, before the dissection was begun, that they would relate what had been observed, and what had been done, in the disorder. Which the senior physician who had attended upon her, did very accurately in the manner I shall relate presently; the others at the same time affirming, that they also had seen, and done, almost the same things, in the others, except that one, who had given fresh-drawn oil of almonds, ingenuously added, that the patient had been worse from it. But let us come to her who was then to be dissected.

A virgin, of two-and-forty years of age, who had, every winter, been subject to a violent cough, of a very good habit of body, and abounding in blood, being employed in great and continual labours, for the service of the convent, was seized, in the night, with a fever, with which she first shivered, and was cold through her whole body, and after that grew hot. After an interval of twenty-four hours, a pain on one side of the breast was added to the fever, together with a difficulty of breathing, a cough quite dry, and a rather hard pulse, which resisted the pressure of the fingers, even almost to the very time of the patient's death. In the progress of the disease, the pain shifted from one side of the breast to the opposite part. There was a sense of weight within the thorax. She could lie down upon neither side. In the blood that was taken from her the serum was of a greenish colour, there was a polypous crust, and the other part of it, that lay under this, had a very great blackness and hardness. And blood was taken away immediately as the pain came on, and after that once, and even twice, in a proper quantity, for a body of that kind; and not only from the arms, but from the feet also, within the same day, as the custom always is here, in regard to women. Nor was any thing omitted besides, of all the remedies customary in disorders of this kind. Nevertheless, on the beginning of the seventh day she died. When I had heard this relation, I said, in dependence upon those appearances, that I have always found after the chief of such kind of symptoms, "Come let the body be dissected; this will be certainly found to be the nature of the disease, that the lungs shall appear to have the substance of liver."

In the thorax, then, when opened by the surgeon, there was no extravasated humour, and no connexion of the lungs with the pleura,

except at the left side; and this was neither very close, nor to any considerable extent. While this connexion was disjoined, and the lungs, on that account, pressed, a turbid serum flowed out, in some considerable quantity; but whether from the lungs, as it seemed to us, or from the interstice left between this and the pleura, within the borders of the connexion, was the more uncertain, as neither the lungs, nor the pleura, in that place, shewed any particular injury; but the lungs were covered with a whitish and thickish kind of membrane, such as I have often described in the foregoing histories, even where the lungs were quite free; and to the corresponding pleura, quite upon the surface, adhered a reddish kind of sediment, such as would subside in water wherein fresh meat had been washed. In another place, where there had been no adhesion, the surface of the lungs was prominent into a kind of tubercle, which being cut into, discharged a whitish kind of serum like pus. We then ordered the lungs to be taken out: and they were not only heavy, but, in more than one place, hard. When they were cut into, they appeared to have a dense and compact substance, like that of the liver, as I had predicted, and not only on the surface, but to great depths internally, being in other parts, in general, of a redder complexion, and abounding with that whitish serum which was found in the tubercle: and from hence it was very evident, that the inflammation of both lobes of the lungs, which already degenerated into supuration, had been the cause of her death. However, in the pericardium was scarcely any serum; and in the heart no polypous concretion was found; because the left ventricle contained scarcely any blood, and the right only a little more, which was black, and not at all fluid.

Having found these appearances, I returned, together with the other physicians, to the place where we are expected by the abbess, and said to her, "It is not an unknown and a rare disorder, as you was afraid, which has carried off so many virgins; but the vehemence of one that is very common, and very well known. And to convince you that it is really so, I foretold, previously to the dissection of the body, that the lungs would be found to be in such a state, as they were really found to be in; and this it would have been impossible for me to have done, if I had not very frequently dissected those, who died of this disorder: and I did it on purpose, that you yourselves might readily understand that to be true, which I just now pronounced." By this means they were freed from their fears,

and their opinions of the disease being unknown; and our discourse was turned to propose that method, which has turned out most successfully, by which the other nuns, and especially those who had their lungs very lax, and weak, might beware of the disease; for it did not seem at all doubtful to us, but that the peripneumony could not be overcome in those who had died, chiefly for this cause.

JOHN HUNTER

(1728-1793)

THE SERVICES of JOHN HUNTER in experimental pathology were of inestimable value to the parent science. His greatest contribution was to the theory of inflammation, his views on the nature of which are embodied in his "*Treatise on the Blood, Inflammation and Gunshot Wounds*," published posthumously in 1794. In this is recorded a wealth of experimental detail, capped by shrewd deduction, all presented, unfortunately, in an awkward diction that makes its reading most laborious and tedious. The central theme of this great work is teleology. Hunter approached every phenomenon with a question as to its design and useful import, and brought home to his profession for the first time that the manifestations of inflammation, including suppuration and ulceration, in spite of the associated pain, inconvenience and even deformity, are in the last analysis protective. His theories on the formation of pus influenced Cruveilhier, and were the subject of heated discussion in later years. In another field of pathology Hunter was equally noted, although his views have long since been proved erroneous. This was on the nature of venereal disease. Out of the confused beliefs of the seventeenth and early eighteenth centuries an opinion had steadily been growing that gonorrhoea and chancre were the manifestations of two different venereal diseases. Hunter's experiments, performed by inoculation of his own person, led him to conclude that the diseases were of identical origin. Selections are given below from his "*Treatise on Inflammation*" and his "*Treatise on the Venereal Disease*."

OF INFLAMMATION—ITS STAGES

(From *A Treatise on the Blood, Inflammation and Gun-Shot Wounds*, 1794)

This operation of the body, termed inflammation, requires our greatest attention, for it is one of the most common and most extensive in its effects of any in the animal body; it is both very extensive in its causes, and it becomes itself the cause of many local effects, both salutary and diseased.

It has its different stages in which it produces more immediately

its different effects, which are local; such as adhesions, suppuration, and ulceration, and often death in the part inflamed, together with secondary complaints which are universal, as fever, nervous affections; and when in parts that cannot heal, or in constitutions which are too weak, the hectic fever, next dissolution, or universal death. However, by its forming those adhesions, it often precludes the necessity of suppuration; and also entirely prevents many local diseases where probably suppuration would be the consequence, if such adhesions had not taken place, with all the train of consequences of suppuration, such as abscesses, fistulae, diseased bones, etc., which are prevented by it. It is also one of the modes of action in many specific diseases, and in morbid affections proceeding from poisons.

Inflammation is not only occasionally the cause of diseases, but it is often a mode of cure, since it frequently produces a resolution of indurated parts, by changing the diseased action into a salutary one, if capable of resolution.

By these extensive powers inflammation becomes the first principle in surgery. In one point of view it may be considered as a disease in itself where it takes place without any visible cause; and it may be looked upon as an increase of the mischief, when it is a consequence of some injury; but in either case it is a sign of powers, and of necessary powers; for if a part under the influence of such irritation as should naturally excite inflammation, had either no powers or disposition to exert them, the consequences would be much worse, for mortification would probably take place. I intend at present to consider the most common causes and effects of inflammation, together with the end proposed by nature, in producing it, and the use to which it can be applied in surgery.

It becomes therefore necessary, first to begin with describing its most simple forms, together with its general effects, and then to particularize as I proceed.

Inflammation has several well marked local peculiarities by which it is distinguished.

I shall call by the name of inflammation whatever produces the following local effects, viz. pain, swelling, and redness, in a given time, and these dependent on or the effects of one immediate cause.

Inflammation appears capable of arising from three causes which may be called remote.

First, from some accidental force applied to a part, making a

wound or bruise which cannot recover itself, unless by inflammation. Such violence at least is naturally capable of exciting it.

Secondly, from some irritation which does not destroy the texture of parts, but simply the natural actions, as many irritations, such as pressure, friction, heat, cold, blisters, pungent applications, and often fevers of every kind.

Thirdly, from a particular disposition in parts themselves, as boils arising spontaneously without the constitution having been preconcerted, so little so, as to have given the idea that such inflammations were healthy. Each of these will be of a kind peculiar to the constitution; but from whatever cause inflammation arises, it appears to be nearly the same in all, for in all it is an effect intended to bring about a reinstatement of the parts nearly to their natural functions.

Inflammation may first be divided into two kinds as first principles, viz. the healthy and the unhealthy.

The healthy probably consists only of one kind, not being divisible but into its different stages, and is that which will always attend an healthy constitution or part, is rather to be considered as a restorative action than a diseased one, and would rather appear to be an effect of a stimulus than an irritation. The unhealthy admits of vast variety, (diseases being almost numberless) and is that which always attends an unhealthy constitution or part, and will be according to the kind of health in that constitution or part, but principally according to the constitution; however, many parts naturally have a tendency to run into inflammations of particular kinds. Most of these arising from the nature of the constitution, are, I conceive, in most cases, if not in all, called, although erroneously, the erysepeletous inflammation; which will be further taken notice of.

The simple act of inflammation cannot be called specific, for it is an uniform or simple action in itself; but it may have peculiarities of specific actions superadded.

Inflammation is either single or compound; it may be called single when it has only one mode of action in the part inflamed, as in its first stages; compound, when attended with another mode or when it produces other effects.

Inflammation is capable of producing three different effects, viz. adhesion of the parts inflamed, suppuration in the parts, and ulceration of those parts; which I have called the adhesive, the

suppurative, and the ulcerative inflammation; the last or ulcerative, is properly speaking, only a secondary effect of inflammation, not being performed by the same vessels; however it is possible it may keep up inflammation, as it always keeps up a species of violence, viz. a destruction of the parts.

The two first do not take place in the same vessels, at the same time, but succeed one another, although all the three effects may exist at the same time in the different parts of the same inflammation.

I have placed the adhesive first in order, although it is not always so, for with the respect to the priority of those three actions of inflammation, it depends principally upon the nature of the parts, together with the degrees of violence of the inflammation.

To explain this more fully, we shall first divide the body, respecting inflammation, into two parts, viz. the cellular membrane, or the body in general, together with the circumscribed cavities as belonging to the first; and then all the outlets of the body, as the second. We shall treat of each according to the nature of the parts, and of the inflammation joined, and observe their effects, which will show the common effects of one, as to priority, may be changed into those of the others and become second or third, according to the nature of the parts, the inflammation, and its degree of violence.

We may observe that inflammation, but more especially the suppurative, in the first order of parts, more readily takes place nearer to the surface of the body than in parts more deeply seated, and as a proof of this observation, it has been formerly observed that tumors, and even extraneous bodies, will make their way from some deeper-seated part to the skin, but no inflammation shall take place till they arrive near the skin; but this circumstance will be more fully described when I treat on suppuration.

It does not seem necessary that both surfaces which are to be united should be in a state of inflammation for the purpose of effecting an union; it appears only necessary that one should be in such a state, which is to furnish the materials, viz. to throw out the coagulating lymph, and the opposite uninflamed surface should be in a state of inflammation, to admit of union; for I just observed, that extravasated blood produces an union without inflammation; and we often find adhesions of parts which can hardly be called inflamed.

Thus a truss applied to a rupture will produce adhesions as has been observed, although it may fit very easily.

In describing inflammation it will be found that the principal theory of inflammation will be introduced in the adhesive stages; for in the first stated parts it appears only preparatory to the suppurative either in preventing or promoting it.

When inflammation takes place in the first order of parts, it is commonly the adhesive, but it will be according to circumstances whether the suppurative or the ulcerative follows first. That either the one or the other should follow, seems to rise in many cases from an increase of the inflammation; but it sometimes happens that the suppurative takes place almost immediately; and probably from two causes; the first is, the intensity of the inflammation, its exceeding the adhesive almost immediately; the second, an inflammation of a different kind, where the adhesive makes no part of the inflammation, and suppuration takes place in the first instance. I suspect that the erysepeletous inflammation has very little of the adhesive in its nature, and therefore probably these inflammations are in some degree of this nature, and go into suppuration without adhesions. In some cases ulcerations must take place prior to suppuration, as when an inflammation happens on a surface viz. the skin, as for instance, in a chancre, and with such violence as is necessary for suppuration to take place, then ulceration must begin first, so as to expose internal surfaces for suppuration; but in the parts of the second order, viz. internal canals or duct, it is the suppurative inflammation which most readily takes place first; but if carried further the adhesive follows, as will be more fully explained hereafter. When it is an inflammation of the first order of parts, the suppurative succeeds the adhesive, and the ulcerative may be said to be an action superadded to the suppurative, arising out of effects produced by the first, now becoming new causes, the suppurative naturally taking place in the time of the first, and the ulcerative in consequence of the suppurative, which has called forth the action of another system of vessels, the absorbents; all of which may be reckoned as three different modes of action arising from the first irritation or cause.

The adhesive, as also the suppurative inflammation, either in the first or second orders of parts, with their varieties, may have a principle superadded, which does not in the least alter their inflammatory mode of action, which still continues to go on. This

principle is some specific disposition, from scrophula, or poisons, as the venereal, small-pox, etc.

These three different modes of action, viz. the adhesive, the suppurative, and the ulcerative, when carried on perfectly, are generally the effects of a good constitution, seldom attending the unhealthy; they are what I would call common inflammation.

I have already observed that common inflammation either takes place in parts that constitute the largest part of the animal, which are all the circumscribed cavities, all the cellular membrane, and the substance of every part, the two last of which are the most universal; or upon internal canals or outlets, which are, in common, only excretory ducts.

That whatever has a tendency to discharge any extraneous matter, whether already existing, as matter already formed, or a ball lodged, etc., or only preparatory to its formation such as inflammation that has a disposition to suppurate, the inflammation is always greatest and extends farthest on that side next to the skin; for instance, suppose a man shot in the thigh, the ball passes through to within an inch or two of the opposite side; the ball has not deadened any part for an inch or two of the last part of its passage so as to allow this part to unite, we shall find if that ball excites inflammation, it will not be along its passage where we should (without knowing the principle) have mostly expected it, but the inflammation will commence on that side next to the opposite skin that has not in the least been hurt. If a ball passes quite through, a piece of cloth is carried in, and lies in the middle between the two orifices; if the passage is pretty superficial, say only an inch distant from the skin where the cloth lies, but which is two or three inches from either orifice, we shall find that the inflammation for its exit will not lead to either orifice, but directly across to the skin.

As the adhesive inflammation precedes the suppurative in every part of the body, except the outlets, as was observed, and the suppurative commonly precedes the ulcerative, excepting on an external surface, the propriety of following, likewise, this order of nature in treating of them will appear evident, especially as each succeeding inflammation is in some measure illustrated by that which has gone before.

OF PUS

(From *A Treatise on the Blood, Inflammation and Gun-shot Wounds*, 1794)

Hitherto I have been treating of the operations of parts, preparatory to the formation of pus; I am now come to the formation of that fluid, its nature and supposed uses.

The immediate effect of the mode of action above described, is the formation of a fluid, commonly termed pus; this is very different from what was discharged in the time of the adhesive stage of the inflammation, when either formed in the cellular membrane or circumscribed cavities; it is also very different from the natural secretion of internal canals, though it is probably formed in both by the same vessels, but under very different modes of action.

The cellular membrane, or circumscribed cavities, have their vessels but little changed from the adhesive state at the commencement of the suppurative disposition; so that they still retain much of the form they had acquired by the first state, the discharge being at the beginning little more than coagulating lymph mixed with some serum. This is scarcely different from the adhesive stage of the inflammation; but as the inflammatory disposition subsides, the new disposition is every instant of time altering those vessels to their suppurative state; the discharge is also varying and changing from a species of extravasation to a new formed matter peculiar to suppuration; this matter is a remove further from the nature of the blood, and becomes more and more of the nature of the pus; it becomes whiter and whiter, losing more and more of the yellow and green, which it is apt to give the linen that is stained with it in its first stages, and in consistence more and more viscid, or creamy.

By the formation of this new substance, the coagulating lymph, which was extravasated in the adhesive state of the inflammation, and adhered to the sides of the cells, either in cut surfaces as in wounds, in abscesses, or circumscribed cavities, is pushed off from these surfaces, and if it is the inner surface of a cavity, it is pushed into it, so that the cavity contains both coagulating lymph and pus; or if it is a cut surface, the coagulating lymph is separated from it by the suppuration taking place, and is thrown off; but as such surfaces are generally dressed immediately after the operation, while the wound is bleeding, this blood unites the dressings to the sore, which is assisted afterwards by the coagulating lymph thrown

out in the adhesive stage, the whole, viz. dressings, blood, and coagulating lymph are generally thrown off together, when suppuration commences on these surfaces. This is the process which takes place in the first formation of an abscess, and the first process towards suppuration in a fresh wound.

Upon the internal surfaces of the canals, the parts do not go through all those steps; they would appear to run into suppuration almost instantaneously; however, inflammation even here is a kind of forerunner of suppuration. This discharge, from internal canals, has never been reckoned true matter, it has been called mucus, etc. but it has all the characters of true pus, which I am yet acquainted with.

Pus is not to be found in the blood, similar to that which was produced in the first stage; but is formed from some change, decomposition, or separation of the blood, which it undergoes in its passage out of the vessels, and for effecting which the vessels of the parts have been formed, which produces a subsiding of the inflammation from which it took its disposition; hence it must appear, that the formation of pus consists of something more than a straining of juices from the blood. Many substances indeed which are to be considered as extraneous bodies in the blood, being only mixed with, and not making an essential part of that fluid, and perhaps even necessary to it, may pass off with the pus, as with every other secretion, yet the pus is not to be considered on that account as simply parts of the blood unchanged; but we must look upon it as a new combination of the blood itself, and must be convinced that in order to carry on the decompositions and combinations necessary for producing this effect, either a new or peculiar structure of vessels must be formed, or a new disposition, and of course a new mode of action of the old must take place. This new structure, or disposition of vessels, I shall call glandular, and the effect or pus, a secretion.

EXPERIMENTS MADE TO ASCERTAIN THE PROGRESS AND EFFECTS OF THE VENEREAL POISON

(From *A Treatise on the Venereal Disease*, 1786)

To ascertain several facts relative to the venereal disease, the following experiments were made. They were begun in May, 1767.

Two punctures were made on the penis with a lancet dipped in

venereal matter from a gonorrhoea; one puncture was on the glans, the other on the prepuce.

This was on a Friday; on the Sunday following there was a teasing itching in those parts, which lasted till the Tuesday following. In the mean time, these parts being often examined, there seemed to be a greater redness and moisture than usual, which was imputed to the parts being rubbed. Upon the Tuesday morning the parts of the prepuce where the puncture had been made were redder, thickened, and had formed a speck; by the Tuesday following the speck had increased, and discharged some matter, and there seemed to be a little pouting of the lips of the urethra, also a sensation in it in making water, so that a discharge was expected from it. The speck was now touched with lunar caustic, and afterwards dressed with calomel ointment. On Saturday morning the slough came off, and it was again touched, and another slough came off on the Monday following. The preceding night the glans had itched a good deal, and on Tuesday a white speck was observed where the puncture had been made; this speck, when examined, was found to be a pimple full of yellowish matter. This was now touched with the caustic, and dressed as the former. On the Wednesday the sore on the prepuce was yellow, and therefore was again touched with caustic. On the Friday both sloughs came off, and the sore on the prepuce looked red, and its basis not so hard; but on the Saturday it did not look quite so well, and was touched again, and when that went off it was allowed to heal up, as also the other, which left a dent in the glans. This dent on the glans filled up in some months, but for a considerable time it had a bluish cast.

Four months afterwards the chancre on the prepuce broke out again; and very stimulating applications were tried; but these seemed not to agree with it, and nothing being applied, it healed up. This it did several times afterwards, but always healed up without any application to it. That on the glans never did break out, and herein also it differed from the other.

While the sores remained on the prepuce and glans a swelling took place in one of the glands of the right groin. I had for some time conceived an idea that the most effectual way to put back a bubo was to rub in mercury on that leg and thigh; and thus a current of mercury would pass through the inflamed gland. Here was a good opportunity of making the experiment. I had often suc-

ceeded in this way, but now wanted to put it more critically to the test. The sores upon the penis were healed before the reduction of the bubo was attempted. A few days after beginning the mercury in this method the gland subsided considerably. It was then left off, for the intention was not to cure it completely at present. The gland some time after began to swell again, and as much mercury was rubbed in as appeared to be sufficient for the entire reduction of the gland; but it was meant to do no more than to cure the gland locally, without giving enough to prevent the constitution from being contaminated.

¶ About two months after the last attack of the bubo, a little sharp pricking pain was felt in one of the tonsils in swallowing anything, and on inspection a small ulcer was found, which was allowed to go on till the nature of it was ascertained, and then recourse was had to mercury. The mercury was thrown in by the same leg and thigh as before, to secure the gland more effectually, although that was not now probably necessary.

As soon as the ulcer was skinned over the mercury was left off, it not being intended to destroy the poison, but to observe what parts it would next affect. About three months after, copper-colored blotches broke out on the skin, and the former ulcer returned in the tonsil. Mercury was now applied the second time for those effects of the poison upon the constitution, but still only with a view to palliate.

It was left off a second time, and the attention was given to mark where it would break out next; but it returned again in the same parts. It not appearing that any farther knowledge was to be procured by only palliating the disease a fourth time in the tonsil, and a third time in the skin, mercury was now taken in a sufficient quantity, and for a proper time, to complete the cure.

The time the experiments took up, from the first insertion to the complete cure, was about three years.

The above case is only uncommon in the mode of contracting the disease, and the particular views with which some parts of the treatment were directed; but as it was meant to prove many things which, though not uncommon, are yet not attended to, attention was paid to all the circumstances. It proves many things, and opens a field for farther conjecture.

It proves, first, that matter from a gonorrhoea will produce chancres.

It makes it probable that the glans does not admit the venereal irritation so quickly as the prepuce. The chancre on the prepuce inflamed and suppurated in somewhat more than three days, and that on the glans in about ten. This is probably the reason why the glans did not throw off its sloughs so soon.

It renders it highly probable that to apply mercury to the legs and thighs is the best method of resolving a bubo; and, therefore, also the best method of applying mercury to assist in the cure, even when the bubo suppurates.

It also shows that buboes may be resolved in this way, and yet the constitution not be safe; and therefore that more mercury should be thrown in, especially in cases of easy resolution, than what simply resolves the bubo.

It shows that parts may be contaminated, and may have the poison kept dormant in them while under a course of mercury for other symptoms, but break out afterwards.

It also shows, that the poison having originally only contaminated certain parts, when not completely cured, can break out again only in these parts.

MATTHEW BAILLIE

(1761-1823)

A NEPHEW of William and John Hunter, trained particularly by the former, but intimately associated with both, MATTHEW BAILLIE of Lanarkshire and London, brought out the first English textbook of pathology, "The Morbid Anatomy of Some of the Most Important Parts of the Human Body" (1793). This was supplemented by a beautifully engraved atlas (1799-1802). The "Morbid Anatomy" is not only the first English, but, as a matter of fact, the first book in any language treating the subject of pathology as an independent science, capable of cultivation apart from its immediate application to the practice of medicine. It proved exceedingly popular, was promptly translated into German and French, and rapidly went into new editions. It is written in a simple, straightforward style, easily followed. The following are representative selections from this work.

TUBERCLES OF THE LUNGS

There is no morbid appearance so common in the lungs as that of tubercles. These consist of rounded, firm, white bodies, interspersed through their substance. They are, I believe, formed in the cellular structure which connects the air-cells of the lungs together, and are not a morbid affection of glands, as has been frequently supposed. There is no glandular structure in the cellular connecting membrane of the lungs; and on the inside of the branches of the trachea, where there are follicles, tubercles have never been seen. They are at first very small, being not larger than the heads of very small pins, and in this case are frequently accumulated in small clusters. The smaller tubercles of a cluster probably grow together, and form one larger tubercle. The most ordinary size of tubercles is about that of a garden pea, but they are subject, in this respect, to much variety. They adhere pretty closely to the substance of the lungs, and have no peculiar covering or capsule. When cut into, they are found to consist of a white smooth substance, having great firmness and often contain in part a thick, curdy pus. When a tubercle is almost entirely changed into pus, it appears like a white capsule in which the pus is lodged. When several tubercles of considerable size are grown together, so as to form a pretty large tuberculated

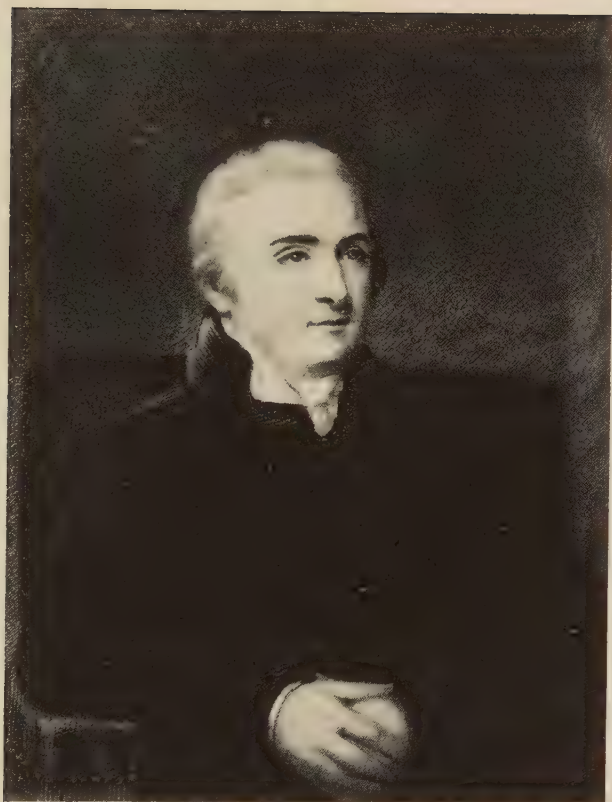


PLATE 12. MATTHEW BAILLIE (1761-1823)

mass, pus is very generally found upon cutting into it. The pus is frequently thick and curdly; but when in considerable quantity it is thinner, and resembles very much the pus from a common sore. In cutting into the substance of the lungs, a number of abscesses is sometimes found, from pretty large tubercles having advanced to a state of suppuration. In the interstices between these tubercles, the lungs are frequently of a harder, firmer texture, with the cells in a great measure obliterated. The texture of the lungs on many occasions, however, round the boundaries of an abscess, is perfectly natural.

I have sometimes seen a number of small abscesses interspersed through the lungs, each of which was not larger than a pea. The pus in these is rather thicker than what arises from common inflammation, and resembles scrofulous pus. It is probable that these abscesses have been produced by a number of small scattered tubercles taking on the process of suppuration. The lungs immediately surrounding these abscesses are often of a perfectly healthy structure, none of the cells being closed up by adhesions.

When tubercles are converted into abscesses, it forms one of the most destructive diseases in this island, viz. phthisis pulmonalis. Tubercles are sometimes found in the lungs of children at a very early age, viz. two or three years old, but they most frequently occur before the completion of the growth. They are apt likewise to be formed at rather an advanced age.

In cutting into the lungs, a considerable portion of their structure sometimes appears to be changed into a whitish soft matter, somewhat intermediate between a solid and a fluid, like a scrofulous gland just beginning to suppurate. This appearance I believe is produced by scrofulous matter being deposited in the cellular substance of a certain portion of the lungs, and advancing towards suppuration. It seems to be the same matter with that of the tubercle, but only diffused uniformly over a considerable portion of the lungs, while the tubercle is circumscribed.

ULCERS IN THE STOMACH

Opportunities occasionally offer themselves of observing ulcers of the stomach. These sometimes resemble common ulcers in any other part of the body, but frequently they have a peculiar appearance. Many of them are hardly surrounded with any inflammation, nor have they irregular eroded edges as ulcers have generally, nor

is there any particular diseased alteration in the structure of the stomach in the neighbourhood. They appear very much as if, some little time before, a part had been cut out from the stomach with a knife, and the edges had healed, so as to present an uniform smooth boundary round the excavation which had been made. These ulcers sometimes destroy only a portion of the coats of the stomach at some one part, and at other times destroy them entirely. When a portion of the coats is destroyed entirely, there is sometimes a thin appearance of the stomach surrounding the hole, which has a smooth surface, and depends on the progress of the ulceration. At other times the stomach is a little thickened surrounding the hole; and at other times still, it seems to have the common natural structure.

SCIRRHUS AND CANCER OF THE STOMACH

This affection of the stomach is not very uncommon towards an advanced period of life, and, I think, is more frequently met with in men than in women. This perhaps arises from the greater intemperance in the one sex than in the other. It cannot, however, be produced entirely by intemperance; there must be added a considerable predisposition of the parts towards this disease. Hence, when there is no previous disposition, the stomach does not become affected with this disease, whatever be the intemperance. When, however, there is this previous disposition, there is reason to think that it is encouraged and brought forward by this mode of living.

Scirrhus sometimes extends over almost every part of the stomach, but most commonly it attacks one part. The part which is affected with scirrhus has sometimes no very distinct limit between it and the sound structure of the stomach, but most commonly the limit is very well marked. When scirrhus attacks a portion of the stomach only, it is generally towards the pylorus. The principal reason of this probably is, that there is more of glandular structure in that part of the stomach than any other; and it would appear that glandular parts of the body are more liable to be affected with scirrhus than parts of the body generally.

When the whole stomach, or a portion of it, is scirrhus, it is much thicker than usual, as well as much harder. When the diseased part is cut into, the original structure of the stomach is frequently marked with sufficient distinctness, but very much altered from the natural appearance. The peritoneal covering of the stomach

is many times thicker than it ought to be, and has almost a gristly hardness. The muscular part is also very much thickened, and is intersected by frequent pretty strong membranous septa. These membranous septa are, probably, nothing else than the cellular membrane intervening between the fasciculi of the muscular fibres, thickened from disease. The inner membrane is also extremely thick and hard, and not unfrequently somewhat tuberculated towards the cavity of the stomach.

It very frequently happens that this thickened mass is ulcerated upon its surface, and then a stomach is said to be cancerous. Sometimes the inner membrane of the stomach throws out a process which terminates in a great many smaller processes, and produces what has commonly been called a fungous appearance.

It also happens that the stomach at some part loses entirely all vestige of the natural structure, and is changed into a very hard mass, of a whitish or brownish colour, with some appearance of membrane intersecting it; or it is converted into a gristly substance, like cartilage somewhat softened. The absorbent glands in the neighborhood are at the same time commonly enlarged and have a very hard white structure.

MARIE-FRANÇOIS-XAVIER BICHAT

(1771-1802)

MODERN HISTOLOGY and histological pathology have their origin in the labor and genius of MARIE-FRANÇOIS-XAVIER BICHAT, a native of eastern France, whose chief stimulation in medicine came from personal contact with the surgeon Pierre-Joseph Desault and the published works of the physician Philippe Pinel. The latter had classified inflammations into those of skin, mucous membranes, serous membranes, connective tissues, muscles and joints. In his famous "Treatise on Membranes" (1799-1800) Bichat greatly elaborated the distinctions involved. Up to this time anatomy had been a matter of organs and gross divisions. Bichat created a new science, general anatomy, which took account of the structure of organs, and correlated the progress of disease with changes in this finer architecture. For the first time we hear of the abnormalities of tissue. Through this development Bichat formed the connecting link between Morgagni, who had so greatly influenced the teaching of organ pathology, and Virchow, who developed the concept of a pathology of cells. The following selection is from the "Anatomie Générale" (1801-2).¹

What I have been saying leads to important consequences, as it respects those acute or chronic diseases that are local; for those, which like most fevers, affect almost simultaneously every part, cannot be much elucidated by the anatomy of systems. The first then will engage our attention.

Since diseases are only alterations of the vital properties, and each tissue differs from the others in its properties, it is evident there must be a difference also in the diseases. In every organ then, composed of different tissues, one may be diseased, while the others remain sound; now this happens in a great many cases; let us take the principal organs, for example.

1st. Nothing is more rare than affections of the mass of the brain; nothing is more common than inflammation of the tunica arachnoides that covers it. 2d. Oftentimes one membrane of the eye only is affected, the others preserving their ordinary degree of vitality.

¹ From the translation of George Hayward, Boston, 1822 (with the word "tissue" substituted for "texture" as written by Hayward).



PLATE 13. MARIE-FRANÇOIS-XAVIER BICHAT
(1771-1802)

3d. In convulsions or paralysis of the muscles of the larynx, the mucous surface is unaffected; and on the other hand the muscles perform their functions as usual in catarrhs of this surface. Both these affections are foreign to the cartilages, and vice versa. 4th. We observe a variety of different alterations in the tissue of the pericardium, but hardly ever in that of the heart itself; it remains sound while the other is inflamed. The ossification of the common membrane of the red blood does not extend to the neighbouring tissues. 5th. When the membrane of the bronchia is the seat of catarrh, the pleura is hardly affected at all, and reciprocally in pleurisy the first is scarcely ever altered. In peripneumony, when an enormous infiltration in the dead body shows the excessive inflammation that has existed during life in the pulmonary tissue, the serous and mucous surfaces often appear not to have been affected. Those who open dead bodies know that they are frequently healthy in incipient phthisis. 6th. We speak of a bad stomach, a weak stomach; this most commonly should be understood as applying to the mucous surface only. Whilst this secretes with difficulty the nutritive juices, without which digestion is impaired, the serous surface exhales as usual its fluid, the muscular coat continues to contract, etc. In ascites, in which the serous surface exhales more lymph than in a natural state, the mucous oftentimes performs its functions perfectly well, etc. 7th. All authors have said much of the inflammation of the stomach, the intestines, the bladder, etc. For myself, I believe that this disease rarely ever affects at first the whole of any of these organs, except in the case where poison or some other deleterious substance acts upon them. There are for the mucous surface of the stomach and intestines, acute and chronic catarrhs, for the peritoneum serous inflammations, perhaps even for the layer of organic muscles that separates the two membranes, there is a particular kind of inflammation, though we have as yet hardly any thing certain upon this point; but the stomach, the intestines, and the bladder are not suddenly affected with these three diseases. A diseased tissue can affect those near it, but the primitive affection seizes only upon one. I have examined a great number of bodies in which the peritoneum was inflamed either upon the intestines, the stomach, the pelvis, or universally; now very often when this affection is chronic, and almost always when it is acute, the subjacent organs remain sound. I have never seen this membrane exclusively diseased upon one organ, while that of the neighbouring

ones remain untouched; its affection is propagated more or less remotely. I know not why authors have hardly ever spoken of its inflammation, and have placed to the account of the subjacent viscera that which most often belongs only to this. There are almost as many cases of peritonitis as of pleurisy, and yet while these last have been particularly noticed the others are almost entirely overlooked. Oftentimes that part of the peritoneum corresponding to an organ, is much inflamed; we see it in the case of the stomach; we observe especially after the suppression of the lochia or the menses, that it is the portion that lines the pelvis that is first affected. But soon the affection becomes more or less general; at least examinations after death prove it satisfactorily. 8th. Certainly the acute or chronic catarrh of the bladder, or womb even, has nothing in common with the inflammation of that portion of the peritoneum corresponding with these organs. 9th. Every one knows that diseases of the periosteum have oftentimes no connection with the bone, and vice versa, that frequently the marrow is for a long time affected, while both the others remain sound. There is no doubt that the osseous, medullary and fibrous tissues have their peculiar affections which we shall not confound with the idea we may form of the diseases of the bones. The same can be said of the intestines, of the stomach, etc. in relation to their mucous, serous, muscular tissues, etc. 10th. Though the muscular and tendinous tissues are combined in a muscle, their diseases are very different. 11th. You must not think that the synovial is subject to the same diseases as the ligaments that surround it, etc.

I think the more we observe diseases, and the more we examine bodies, the more we shall be convinced of the necessity of considering local diseases, not under the relation of the compound organs, which are rarely ever affected as a whole, but under that of their different tissues, which are almost always attacked separately.

When the phenomena of diseases are sympathetic, they follow the same laws as when they arise from a direct affection. Much has been said of the sympathies of the stomach, the intestines, the bladder, the lungs, etc. But it is impossible to form an idea of them, if they are referred to the organ as a whole, separate from its different tissues. 1st. When in the stomach, the fleshy fibres contract by the influence of another organ and produce vomiting, they alone receive the influence, which is not extended either to the serous or mucous surfaces; if it were, they would be the seat, the one of exhalation,

the other of sympathetic exhalation and secretion. 2d. It is certain that when the action of the liver is sympathetically increased, so that it pours out more bile, the portion of peritoneum that covers it does not throw out more serum, because it is not affected by it. It is the same of the kidney, the pancreas, etc. 3d. For the same reason, the gastric organs upon which the peritoneum is spread, do not partake of the sympathetic influences that it experiences. I shall say as much of the lungs in relation to the pleura, the brain in relation to the tunica arachnoides, the heart to the pericardium, etc. 4th. It is undeniable that in all sympathetic convulsions, the fleshy tissue is alone affected, and that the tendinous is not so at all. 5th. What has the fibrous membrane of the testicles in common with the sympathies of its peculiar tissue? 6th. No doubt a number of sympathetic pains that we refer to the bones, are seated exclusively in the marrow.

I could cite many other examples to prove, that it is not this or that organ which sympathizes as a whole, but only this or that tissue in the organs; besides, this is an immediate consequence of the nature of sympathies. In fact the sympathies are but aberrations of the vital properties; now these properties vary according to each tissue; the sympathies of these tissues then would do the same.

Observe what takes place in fever, accompanying the different kinds of inflammation. That attending the mucous is slight, that with the serous severe, and that with the cutaneous has the peculiar character of showing itself some days before the eruptions, as has been noticed by Pinel. If we attentively observe the fever which attends the inflammations of all the systems, we shall find as many differences, as many peculiar characters, as there are systems. Whence does this arise? From the difference of the relations that unite the heart to each kind of tissue; now this difference of relations is the result of the difference of the vital forces peculiar to each.

Observe the itch, herpes, cancer, venereal disease, etc. when they have ceased to be local affections, they spread themselves universally; they alternately attack different tissues, according to the relation which they have with the organic sensibility of these tissues. But it is almost always separately that they attack them; an organ is never as a whole influenced by them in all its parts. What do I say? If two of these diseases exist at the same time, one seizes upon one tissue, the other upon a different one of the same organ. Thus the stomach, the intestines, the lungs, etc. can be attacked by two

different diatheses, and each will be independent of the other, because each will be fixed upon a different tissue, one upon the mucous, for example, the other upon the serous, etc.

Let us not, however, exaggerate this independence of the tissues of the organs in diseases, lest experience should contradict us. We shall see that the cellular system is oftentimes a medium of communication, not only from one tissue to another in the same organ, but from one organ to a neighbouring one. Thus in many chronic diseases, all the parts of the same organ are gradually changed, and at the examination of this organ after death, the whole of it appears to have been affected, though one of its tissues only was so at first. In the cancer of the breast, you find at first only a small gland that rolls under the finger; finally the glandular, the cellular, and even the cutaneous tissues are confounded in one common cancerous mass. Cancer of the stomach, the intestines, the penis, etc. follows the same course. Observe phthisis, exhibiting in the beginning some small tubercles in the pulmonary tissues, at length invading oftentimes the pleura, the bronchial membrane, etc. How little soever you may examine bodies with a view to the same chronic disease, and at different periods, you will be convinced of the truth of this assertion, viz. that a tissue being at first affected in an organ, communicates its affection gradually to others, and that you will be deceived in judging of the primitive seat of the disease, if you attempt to determine it from the parts found affected at the time of the examination.

In acute diseases, continuity is oftentimes sufficient to explain the different symptoms that appear in tissues that are not affected. The peritoneal coat only being inflamed, vomiting is produced. We cough and sometimes expectorate considerably when the pleura alone is diseased. Delirium comes on when the tunica arachnoides is inflamed, though the intellectual functions are not connected with it. Frequently the diseases of the pericardium are sufficient to disturb the motion of the heart, etc. We cannot deny after this, that oftentimes an alteration in one of the tissues alone of an organ is sufficient to disturb the functions of all the others; but still it is in one only, that the primitive source of the evil exists.

I now pass to some other considerations relative to the influence of the anatomy of systems in diseases.

Since every organized tissue has every where the same arrangement; since, whatever be its situation, it has the same structure and

the same properties, it is evident that its diseases must be every where the same. It makes no difference, that the serous tissue is connected with the brain by the tunica arachnoides, with the lungs by the pleura, with the heart by the pericardium, with the gastric viscera by the peritoneum, etc. every where it is inflamed in the same manner; every where dropsies take place in the same way; every where it is subject to a species of eruption of little whitish tubercles, like the miliary, of which I believe there has been no description, but which deserves great attention; I have already many times observed this peculiar eruption of the serous tissue, which is generally of a chronic character, like most of the cutaneous eruptions; I shall speak of it hereafter. Whatever may be the organ that the mucous tissue invests, its affections have in general the same character, excepting the difference only that arises from variety of structure. I will say the same of the fibrous, cartilaginous tissues, etc. M. Pinel appears to me to have done much for the art, in being the first who arranged inflammations in the order of the systems, and embracing in one general view all those of the same system, whatever may be the organs in which it is found.

There are always two orders of symptoms in inflammations: 1st. those that belong to the nature of the diseased tissues; 2d. those which depend upon the affected organ, in which the inflammation exists. For example, the kind of pain, the nature of the accompanying fever, the duration, the termination, etc. are almost always the same, whatever serous surface is affected. But difficulty of breathing, dry cough, etc. prove it to be the pleura; diarrhoea, constipation, vomiting, etc. that it is the peritoneum; injury of the intellectual functions, that it is the tunica arachnoides; irregular pulse, that it is the pericardium, etc. The first belong to the whole class, the second set of symptoms is confined exclusively to this or that particular sort; now the second are, if we may so say, accessory, depending upon the proximity of the affected tissue with some other tissue. The first are particularly important.

Medicine has yet much to do, in its researches upon the inflammation of the different tissues. We are well acquainted with that of the cellular, the cutaneous, the serous, and the mucous; but that of the others is very obscure. It is yet to be ascertained, which is attacked, the fibrous or muscular, in rheumatism. I am inclined to think that it is the first. Almost every thing remains to be known

in the cartilaginous, the synovial, the arterial, the venous, etc. as it respects their inflammatory phenomena.

In making these researches, it will be necessary to establish one important distinction; that is, 1st. that certain tissues, as the osseous, the muscular of animal life, etc. are precisely the same in all the organs in which they are found, and consequently that their diseases must be the same; 2d. that others, as the cutaneous, the serous, the mucous, etc. experience, according to the organs to which they belong, some variety of structure and vital properties, which necessarily modify the general phenomena of the class of diseases that belong to these tissues; 3d. that others, as the glandular, the muscular of organic life, etc. are very different in each organ; and that their general symptoms and class of diseases must consequently differ considerably.

After having shown most of the local diseases, as affecting almost always, not an individual organ, but some tissue in an organ, it is necessary to show the differences they present according to the tissues they affect. As under each system, this subject will be treated more or less fully, I shall only refer to it here.

We shall see, then, that pain is modified differently in each tissue, according to the degree of sensibility that it possesses. No one excites the same sensations as the others when it is inflamed. Compare the burning of erysipelas with the throbbing of phlegmon, the pain of rheumatism with that of inflamed lymphatic glands, etc. We shall see also that the sense of heat, developed in each inflamed tissue, has a particular character; here it is sharp and biting, there like the feeling produced by fire, etc. There are two general causes that produce a variation in the symptoms of diseases: 1st. the nature of the affected tissue; thus, as I have just said, the inflammation of each produces a different kind of suffering. 2d. The nature of the disease; we know that cancer, whatever tissue it may affect, has a pain that is peculiar to it; that syphilis and scurvy have also a peculiar character, that is, however, modified in a slight degree in each tissue.

The difference of tissues not only modifies the symptoms, but affects the duration of them also. Nothing in medicine is more vague, in this point of view, than the terms acute and chronic, in relation to inflammations of the different tissues. Most commonly they run their course rapidly in the dermoid, cellular, serous, mucous tissues, etc.; on the other hand, they are slow in the bones,

the cartilages, and the fibro-cartilages. If we apply this distinction to the same tissue, it is very well; thus there are catarrhs, serous and cutaneous inflammations, etc. that are acute and chronic. But if we generalize it, it cannot be understood. A catarrh would be chronic if it lasted two months; but this is the common term of an acute inflammation of the bones; a chronic one continues for a whole year or more. Cutaneous, mucous wounds, etc. last only five or six days if they heal by the first intention; while it requires thirty or forty for a bone, a cartilage, etc. to be cicatrized by the juxta-position of its different parts. A disease cannot be classed, then, by its duration, as an acute or chronic one, except in relation to the same system; when we describe it then in a general way, this distinction becomes void.

Physicians consider abstractedly almost all diseases. When they speak of inflammation they describe the redness, swelling, throbbing and pain, as general attributes, always uniform. If of suppuration, they take for a general standard that of the cellular tissue, in phlegmon, without thinking that it is only one of the modifications of suppuration and its product. The same may be said of gangrene, scirrhus, etc. Nothing is more vague and uncertain than the general ideas that are given concerning a disease; they scarcely agree in one or two of the tissues.

It is not only the history of diseases that the anatomy of systems will elucidate; it will change in part the method of treating morbid anatomy. Morgagni, to whom we owe so much in this respect, and many others, to whom the art is indebted, have adopted the general arrangement used in descriptions. They have examined the diseases of the head, the chest, the abdomen, and the extremities. In following this method, they can only form to themselves a general idea of the alterations common to all the tissues. The ideas are necessarily too much contracted, when there is presented only an insulated part of a system, which is composed of a great many others. If, besides this, you obtain a general knowledge of the affections of each system, you must bear in mind, with regard to each, the general ideas concerning the affections of the parts they compose.

It appears to me to be infinitely more simple to consider at first all the affections common to each system, and then to observe what every organ has peculiar to itself in the part that it occupies.

I divide, then, morbid anatomy into two great parts. The first

contains the history of the alterations common to each system, whatever may be the organ in the structure of which it is concerned, or whatever may be the place it occupies. It is necessary to show at first the different alterations of the cellular, arterial, venous, nervous, osseous, muscular, mucous, serous, synovial, glandular, cutaneous tissues, etc. to examine the kind of inflammation, suppuration, gangrene, etc. peculiar to each; to speak of the different enlargements of which they are susceptible, the changes in their nature, which they undergo, etc. Some, as the mucous, the cutaneous, the serous, the glandular, etc. afford in this respect an immense field to morbid anatomy. The others, as the fibrous, the nervous, the muscular, etc. are more rarely changed in their tissue. We shall see hereafter that nutrition alone is performed in these, and that the others are particularly the seat of exhalation, absorption, secretion, etc. functions which suppose much energy in the insensible contractility and organic sensibility, which are connected with all the alterations of tissue.

After having thus pointed out the alterations peculiar to each system, in whatever organ it is found, an examination should be made of the diseases peculiar to each region; as those of the head, the chest, the abdomen, and the extremities, after the common method. Here they may be divided: 1st. Into diseases which can especially affect an organ as a whole, and not one of its tissues alone, which is very rare. 2d. Into the characters peculiar to each portion of this or that tissue; for example in the head, the peculiar symptoms which are seen in diseases of the serous surface of the tunica arachnoides, those in affections of the mucous surface of the pituitary membrane, etc.

This course is incontestably the most natural, though, as in all divisions in which we wish to copy nature, there are many cases which it almost excludes.

It seems to me that we live at a period, when morbid anatomy should take a higher stand. This science is not only that of organic derangements, that take place slowly, as the principles or consequences of chronic diseases, it consists in the examination of all the alterations our organs can undergo, at any period in which we may observe their diseases. With the exception of certain kinds of fevers and nervous affections, every thing in pathology is within the province of this science. How weak appears the reasoning of many great physicians, when we examine it, not in their works,

but on the dead body. Medicine was for a long time excluded from the circle of the exact sciences; it will have a right to be associated with them, at least in the diagnostics of diseases, when we shall every where unite to accurate observation, an examination of the changes our organs undergo. This course is beginning to be that of all rational minds; it will without doubt soon be general. What is observation worth, if we are ignorant of the seat of the disease? You may take notes, for twenty years, from morning to night at the bedside of the sick, upon the diseases of the heart, the lungs, the gastric viscera, etc. and all will be to you only a confusion of symptoms, which, not being united in one point, will necessarily present only a train of incoherent phenomena. Open a few bodies, this obscurity will soon disappear, which observation alone would never have been able to have dissipated.

JEAN-NICOLAS CORVISART

(1755-1821)

ONE OF the greatest teachers in the great French school of medicine which came into being with the general scientific development succeeding the French Revolution, was JEAN-NICOLAS CORVISART. His pupils included Dupuytren, Bayle, Laennec and Bretonneau. Corvisart's outstanding contributions to medical literature were his translation of the work of Leopold Auenbrugger on physical diagnosis by percussion, and his monograph on diseases of the heart. The latter appeared in 1806 with the title "*Essai sur les maladies et les lesions organiques du coeur et des gros vaisseaux.*" The selection below on hypertrophy and fibrosis of the myocardium is from this work "as published under Corvisart's inspection by C. E. Horeau."¹ It is interesting to note that several great monographs on diseases of the heart emanated from the French school, two of them, by Raymond de Vieussens and Jean-Baptiste Senac, antedating Corvisart's, and an almost equally famous one by Jean-Baptiste Bouillaud succeeding it.

ON THE INDURATION OF THE MUSCULAR TISSUE OF THE HEART

The *induration*, of which I am here speaking, must not be confounded with a thickening which the parietes of the heart sometimes acquire in aneurism of the first species. Here, the fleshy fibres, though thicker and firmer, retain all their contractility, while the morbid state under examination, is distinguished by the more or less partial loss of muscular contractility; besides this state is very seldom attended with any dilatation.

I have frequently noticed the *induration* of the muscular tissue of the heart; but in these numerous cases, the induration had attained to different degrees. The following case, which was inserted in the *Journal de Medecine* (Ventose, an. 9) will give the most remarkable example of this affection that I have seen.

Case XXVI. A washer-woman, aged fifty-five years, of a lymphatico-sanguine temperament, had suffered melancholy for a long time, consequently her health was impaired.

¹ Translation by Jacob Gates, Boston, 1812.

Five years after, (1797) her menstruation was suppressed and did not return until 1800. Then a swelling beginning in her legs, was extended to the thighs and abdomen. Respiration was difficult; a cough supervened, which, more distressing at night than during the day, deprived her wholly of sleep. When she hastened her walk, respiration was more difficult, and obscure strokes were felt in the region of the heart. A diarrhoea followed, which dissipated these symptoms. The diarrhoea ceased, and the alarming symptoms were more forcibly renewed. Then she was obliged to keep her bed; her sleep was interrupted by frightful dreams, followed by starting.

When she entered the Clinical Hospital, July 19th, 1800, her pulse was small, frequent, serrated, and concentrated; it did not present great irregularity, but that disorder so easily recognized by the experienced physician, and so hard to describe. The thorax when struck sounded in every part, except the region of the heart; the hand, when applied over this region, was elevated for a considerable extent; in the strokes of this organ, intermissions were sometimes observed, and usually great irregularity.

These phenomena suffice to manifest a lesion of the organs of the circulation; the infiltration of the abdomen did not satisfy me as to the state of the gastric system.

I considered the disease incurable and dissolution near. Diuretics and aperients were administered solely for the purpose of relieving the patient by diminishing, if possible, the infiltration.

The following days, the belly more tense, respiration more difficult. The patient complained of suffocation, and particularly of a fixed and insupportable pain in the epigastrium, and toward the left hypochondrium; she could neither sleep nor breathe except in a sitting posture. The infiltration increased rapidly, and extended to the thorax, especially to the right side. July 29, it reached the face and superior extremities; August 9, it became general. The pulse was smaller, more contracted, intermittent, and irregular. This state continued till the 14th of the same month, when she expired in extreme agony.

On dissection, the face and neck were of a purple color. Every vein of the head and neck was turgid with blood; and all the integuments of the body were infiltrated.

The lungs, at their edges, had contracted slight adhesions with the pleura and mediastinum; they were, otherwise, sound and crepitating. A very small quantity of serum was effused into the

cavities of the thorax, particularly on the left side. The pericardium was very remarkably distended, but contained no water. The heart was much larger than it is usually in a woman of middle size; there was very little adipose substance at its base. The blood flowed from the cavities of the heart, when it was separated, in various directions. The right auricle and ventricle, together with the pulmonary artery, presented nothing remarkable, unless the pillars of the ventricle and the parietes of the auricle were of a very remarkable consistence; and the fleshy parietes, thicker than natural, were so compact that they supported themselves without collapsing; as it always happens when the ventricle is empty. All these parts were elastic; they yielded difficultly to pressure, and were spontaneously re-established. The cavity of the left auricle was dilated, and presented the same consistence as that of the right side. The cavity of the left ventricle appeared greatly distended; its parietes had at least double the usual thickness. They were supported like an arch, and actually formed a fleshy, very elastic, sounding box when struck, as if we had struck on a sort of cornet. This elasticity and property of sounding were the more extraordinary, (as the fleshy portion of this ventricle retained its natural color) and they did not appear converted either into an osseous, or cartilaginous substance, or into any thing analogous; nevertheless, on cutting it, the scalpel underwent a strange resistance, and caused a singular crepitating noise to be heard. With a left ventricle so dilated, and of so great a thickness, the patient ought to have a very large, hard, strong pulse, as all the vascular orifices were so very free; on the contrary it was small, serrated, concentrated, weak, irregular, and at times intermittent; which is very well explained by the elastic hardness of the left portion of the heart, and of the partition of its ventricles, which must give this organ but a painful, very difficult, and imperfect contraction.

There was found, in the abdomen, rather an infiltration of the viscera, than a real effusion into the cavity.

The stomach was contracted. The rest of the abdominal viscera were in their natural state.

I premised that the case just given, was not the only one of the kind which I had found in my practice. I shall not relate the others, as they afford nothing materially different. The cavities of the heart had, in these cases, walls not quite so firm, but sufficiently hard to resist pressure and crepitate under the cutting of the scalpel.

The symptoms of the disease were, here, precisely similar to those described in the preceding case.

The causes of this affection appear to be the same as those which I have pointed out in aneurism of the first species in general; with this difference, however, that in active aneurism the parietes of the heart, at the time when they become thicker, yield to the reaction of the blood and are dilated; while, at the time of the induration I am speaking of, either the induration of the parietes is accompanied with a dilatation of the cavities, or else the indurated heart has preserved its natural capacity. In the first case, we ascertain that the induration happened at some period of a pre-existing dilatation. In short, the substance of heart, in this affection, is deprived of its dilatability and contractility; properties which are no longer in exercise, because the fibres of the heart are partially solidified, consequently form a mass incapable of dilatation and contraction.

In the second case supposed, viz. of non-dilatation, the induration is the first affection evolved; and, for the causes just given, the dilatation cannot be formed.

It is extremely difficult to say what signs can characterize such an affection.

In the first period of its formation, it must present all the signs peculiar to incipient active aneurisms, because the parietes of the heart have thickness and force without having yet acquired extraordinary solidity.

The signs of several lesions of different species are united in the other periods of the disease. Let one, in the first stage of the disease, lay his hand over the region of the heart, and he will sometimes feel obscure strokes as in the case cited, sometimes quick and violent strokes as I have occasionally observed. But these last strokes cannot be produced by the action of the right auricle and ventricle only, but particularly by the left auricle, which, in this case, doubtless fulfils in part the functions of the left ventricle, through which it propels the blood into the arteries. Let one, therefore, compare the state of the pulse, which is small, weak, serrated, and almost imperceptible, with the strong tumultuous strokes of the heart, which I have observed in a similar case, he will find it without any analogy to these strokes. Will he not be inclined, from the consideration of these phenomena, to think that, beside the dilatation of the organ, there is a constriction at the aortic mouth? Here the

error appears almost inevitable; and he will be obliged to embrace the opinion for that which will be the most likely to happen.

As to the treatment, were the first period of this affection known, we might perhaps succeed in preventing its evolution by a debilitating treatment, similar to what has been indicated for active aneurism. But, it must be asked, is the bad diet which induces the induration, capable of yielding to the debilitating treatment? Or is this treatment calculated to prevent the induration from forming? Here I can give nothing decided. Yet, in every case, when the complaint has advanced, the palliative is the only treatment on which there can be any dependence.



PLATE 14. RENÉ-THÉOPHILE-HYACINTHE
LAENNEC (1781-1826). DRAWN AND LITHO-
GRAPHED BY HIMSELF ABOUT 1820 WHILE
ON REST TREATMENT FOR PHTHISIS.

JOSEPH HODGSON

(1788-1869)

NOTABLE CONTRIBUTIONS were made to the understanding of the pathology of the vascular system by JOSEPH HODGSON of Birmingham. Although the condition of aortic aneurysm had long been known and accurately described, his delineation of its characteristics was so noteworthy that among the French the lesion and its associated clinical syndrome later came to be known as the "maladie d'Hodgson." His studies on this subject were put forth in his "Treatise on the Diseases of Arteries and Veins" (1815), a selection from which is here reprinted.

ON THE FORMATION OF ANEURISM IN GENERAL

Notwithstanding the attention which has been given to this branch of pathology, there exists much uncertainty as to the nature of the parts which form an aneurismal sac. The question is simply this: Does aneurism ever consist in a general or partial dilatation of all the coats of an artery, or is it constantly produced by the destruction of all or most of these coats, and the formation of a sac by the influx of the blood into the sheath of the vessel and surrounding parts?

The controversies which have existed upon this subject appear to have arisen from a reluctance to admit the possibility of more than one cause in the production of the same effect, and from an adherence to opinions deduced from very imperfect observations. As the ancients did not examine morbid appearances by dissection, their opinions on all subjects which, like the present, can be decided only by anatomy, must be merely speculative, and of no value. It therefore can be of little consequence whether *Ætius* and *Paulus* did or did not describe aneurism as formed by a dilatation of the coats of an artery, or whether they agreed with most of the other Greeks and with the Arabians in defining aneurism to consist in the rupture of an artery and the effusion of blood into the surrounding parts. *Vesalius* first applied anatomy to the investigation of disease, and he described an aneurism arising from the rupture of a dilated aorta. Subsequent examinations by *Sennertus*, *Elsen-*

erus, Silvaticus, Severinus, Hildanus, Barbette, and others, produced the doctrine that aneurism is universally caused by rupture of the proper coats of an artery. In the meantime Fernelius advanced the doctrine that aneurism is produced by a dilatation of all the coats of an artery, similar to that dilatation which takes place in veins affected with varix. This opinion was supported also by Forrestus, Diemerbroek, and other writers. Further observations gave rise to a third opinion; and the cases recorded by Lancisi, Friend, Guattani, and Morgagni, seemed to prove that aneurism may be occasioned either by the rupture or by the dilatation of the coats of an artery, or by a combination of both circumstances, the dilatation having preceded the rupture. Systematic writers adopted this doctrine with regard to the formation of aneurism, and the different varieties of the disease were distinguished by the terms the true, the spurious, or the mixed aneurism. In the true aneurism a sac was described as formed by a dilatation of the coats of the artery; in the spurious, the coats of the vessel were said to be destroyed and the surrounding parts to form the sac; and the term mixed implied that variety in which the coats of the vessel were dilated to a certain extent, and subsequently by their destruction the true aneurism was converted into the spurious. Innumerable cases were recorded in which the sac appeared to be formed either by dilatation or rupture of the coats of the vessel, and upon these opinions and facts was grounded the doctrine generally received with regard to the formation of aneurism, until the publication of Scarpa's elaborate treatise. This indefatigable anatomist has revived the doctrine of Sennertus, and contends that aneurism is never produced by a dilatation, "but by a corrosion and rupture of the proper coats of the artery, and consequently by the effusion of arterial blood under the cellular sheath, or any other membrane which covers externally the injured artery."

Scarpa acknowledges the existence of that state of praeternatural dilatation of an artery which I have described, and mentions the frequency of its occurrence in the ascending aorta. He details some of the circumstances in which it differs from aneurism, although he admits that the two diseases frequently exist in the same vessel; and observes, that they have generally been confounded under the same denomination. The circumstances however in which they differ are so remarkable, that in a pathological point of view they require discrimination. I shall therefore offer a few remarks upon

the subject before I detail the result of my own observations with regard to the formation of aneurism.

The disease to which I allude consists in a praeternatural dilatation of the whole circle of an artery, and not in a partial or lateral distension of its coats. The root of an aneurismal sac however never or very rarely occupies the whole circumference of the vessel, but commences on one side by a neck which is in most instances narrower than the body of the tumour. An artery is sometimes praeternaturally dilated without any morbid alteration having taken place in the texture of its coats. On the other hand, the structure of most aneurismal sacs differs essentially from that of a dilated artery. The former in general possesses a smooth membranous surface lined with coagulum, and in an advanced stage of the disease it exhibits no traces of the coats of the vessel; whilst the latter possesses an uniformity of structure, and is evidently composed of the coats of the artery, which are generally in a morbid condition. The passage of the blood is not so materially interrupted in a dilated artery as when it passes into the recess of an aneurismal sac, and consequently grumous clots and lamellated coagulum, which are almost constantly deposited in aneurisms, are never met with in dilated arteries. These observations show that there is an essential difference between the praeternatural dilatation of the whole circle of an artery and an aneurismal sac, whether it originates in the destruction or partial dilatation of the coats of the vessel.

My own observations will not allow me to coincide with Scarpa in defining aneurism to be constantly produced by a destruction of the coats of an artery. On the contrary, the inspection of innumerable preparations of this disease contained in the principal museums of this metropolis, and the more minute examination by dissection of various specimens of diseased arteries, and of aneurisms in the different stages of their formation, have produced a conviction in my mind, that although in most aneurismal sacs, especially in those which have arrived at a considerable size, the coats of the vessel have given way, yet in a great proportion of aneurisms the disease commenced in a partial dilatation of the coats of the artery. The evidence upon which this opinion is founded will be detailed in the following observations on the formation of aneurism, 1st, by destruction; and 2dly, by a partial dilatation of the coats of the vessel.

A great proportion of the aneurismal sacs which I have had an opportunity of examining, were unquestionably formed in the manner which Scarpa has described, namely, by a destruction of the internal and middle coats of the artery, and the expansion of the external or cellular coat into a sac. The cellular coat at length gives way, and the sheath of the artery and the surrounding parts form the boundary of the tumour. When the internal and middle coats of an artery are divided, and air or water is injected into the vessel, the external coat bulges very considerably, and constitutes a small aneurismal sac. Nicholls exhibited this experiment to the Royal Society by injecting water into the pulmonary artery with such a degree of force, that he ruptured the internal and middle coats, and distended the external. I have frequently repeated the experiment by dividing the internal and middle coats of different arteries by the application of a ligature, which being removed, and the vessel forcibly inflated, the external coat has always exhibited a sufficient degree of dilatation to prove that it is more liable to yield and to be expanded into a sac, than to be ruptured by the impulse of the circulating blood. It appears therefore that when the internal and middle coats are destroyed, the sac is in the first instance formed by an expansion of the external coat of the artery: as the distention advances this membrane gradually gives way; the sheath of the vessel then restrains the effusion, and yielding in its turn, the surrounding parts, whatever may be their texture, form the walls of the extravasation. The inflammation that is excited in the coats of the artery by the primary disease, and subsequently in the surrounding parts by their distention, produces amongst them an effusion of lymph which glues them together, and prevents the effusion of blood into the cellular membrane. Thus is the sac formed, and the inflammation which exists within it produces an effusion of lymph with which its internal surface is lined like that of an abscess.

The causes which give rise to the destruction of the internal and middle coats of an artery are ulceration and rupture. Ulceration, as I have already observed, is rarely met with in the coats of an artery which have not undergone some previous morbid alteration. It, however, frequently takes place in arteries the coats of which contain atheromatous or calcareous depositions. The internal coat first gives way; the destruction of the middle follows, and

is accelerated by the infiltration of the blood amongst its fibres. The external coat becomes incapable of resisting the force of the circulation, and yields so as to form the sac of the aneurism. My friend Mr. Brodie favoured me with a diseased and thickened aorta, which exhibited these processes in a very early stage. The internal and middle coats were destroyed apparently by ulceration, and the external was expanded into a small pouch not larger than a pea.

The formation of an aneurismal tumour, in the generality of cases, is preceded by rupture of the internal and middle coats of the artery; the destruction of these coats by ulceration is a less frequent cause of aneurism. When the internal coat has undergone those morbid changes which I have described under the denominations of the steatomatous and cartilaginous thickenings, or when calcareous matter is deposited in its substance, it frequently cracks and hangs in scales into the cavity of the vessel. The disease is sometimes so extensive, that the middle coat becomes involved in it; the fissure extends throughout its substance, and its fibres are readily separated by the impulse of the circulation. The blood thus comes in contact with the external coat, which is dilated into a sac, in the same manner as when the internal and middle coats are destroyed by ulceration. The aorta of a lady, whose case I have already detailed, illustrated this stage of the formation of aneurism. The internal coat was throughout converted into cartilage, or covered with calcareous depositions. At the arch of the aorta there was a transverse rent about an inch in length, which had penetrated also the middle coat. The blood had insinuated itself between the middle and external coats, the latter of which was elevated into a tumour about two inches in circumference, and presented the appearance of a circumscribed ecchymosis. I conceive, that had the patient survived, this condition of the aorta would have given rise to the formation of an aneurism. A similar appearance was observed by Nicholls in the examination of the body of George the Second. "In the trunk of the aorta," says Nicholls, "we found a transverse fissure on its inner side about an inch and a half long, from which some blood had recently passed under its external coat, and formed an elevated ecchymosis." The laceration of the internal and middle coats of the artery generally takes place during some violent exertion. Having lost its natural elasticity by the

disorganization of its structures, the artery is unable to resist the impulse of the circulation; and hence patients generally date the commencement of their aneurisms from the occurrence of some accident or violent exertion. I have never, however, met with the laceration of the coats of an artery which had not undergone some previous morbid alteration, nor do I think it probable that any exertion which did not lacerate the surrounding parts could be sufficient to rupture the coats of a healthy vessel. Richerand says, that by violently extending the leg upon the thigh the internal and middle coats of the popliteal artery are ruptured, and thus he accounts for the frequency of aneurisms in the ham. I have several times repeated this experiment, but have never lacerated the coats of the artery unless the degree of violence was sufficient at the same time to rupture the ligaments of the knee, an event which can rarely be supposed to take place in those accidents to which the origin of aneurisms is attributed. Again, the experiments of Dr. Jones prove that the sudden laceration of the internal and middle coats of a healthy artery is not followed by the formation of an aneurism. An effusion of lymph takes place, which renders the vessel more firm at that part. Mr. Hunter and Sir Everard Home also peeled off the external coats of an artery in a living animal, to ascertain whether a deficiency of these coats would be attended with a dilatation of the internal, but they found that dilatation was not the consequence, and the effusion of lymph which took place upon the artery rendered it more firm and less capable of dilatation than in its natural state. The constant existence of disease in the coats of every artery which is the seat of aneurism, renders it probable, therefore, that the loss of elasticity predisposes to laceration from causes which would not be productive of that effect in a vessel which possessed its healthy properties.

The destruction of the coats of the vessel generally takes place in a transverse direction. Sometimes, more especially in the arteries of the third order, the whole circle of the vessel is separated, and in other instances the division is partial, and the artery appears as if it had been opened by an instrument. Sometimes the destruction of the coats takes place in a longitudinal direction; sometimes it has a circular appearance, and its edges form a partition between the cavity of the sac and that of the artery.

Cases in which aneurisms appear to have been produced by de-

struction of the coats of the vessel, abound in surgical and pathological writings. It is sufficient however, in confirmation of the facts which I have stated, to refer to those recorded by Scarpa, Morgagni, Lancisi, Guattani, Desault, Warner, and Home, and to the plates of Scarpa and Guattani.

But is every aneurism produced by a destruction of the internal and middle coats of the vessel, and does not a partial dilatation of these coats occasionally precede and give rise to their destruction? I believe that this is frequently the case. We have seen that the disorganization of the coats of an artery by destroying their natural elasticity will give rise to a permanent dilatation of the whole circumference of the vessel; and there is every reason to expect that a loss of its elasticity in a portion only of the diameter of the vessel, will give rise to a partial dilatation of its coats. Indeed the proofs of a partial dilatation of the coats of an artery, particularly of the aorta, are incontestably established by the possibility of tracing the coats of the vessel throughout the whole extent of the expansion, and by the existence of those morbid appearances in the sac which are peculiar to the coats of arteries.

In the year 1811 I dissected an aneurism of the aorta, which was removed from the body of a young woman by my friend Dr. Farre. The sac was as large as a small melon, and had proved fatal by bursting into the posterior mediastinum, and subsequently into the cavity of the thorax. This aorta exhibited the formation of aneurism by partial dilatation in three distinct stages. The internal coat was throughout inflamed, and presented a fleshy and irregular appearance. At the arch of the aorta there was a dilatation not larger than the half of a small pea. About two inches lower in the same vessel was a second dilatation which would have contained a hazel nut, and immediately above the diaphragm was the large aneurism which had proved fatal. I removed that portion of the vessel which contained the smallest dilatation, and macerated it until its coats could be separated without violence. I found that the dilatation existed equally in the three coats of the vessel, and, when separated, each presented the appearance of a minute aneurism. The second dilatation exhibited the same circumstances in a more advanced stage. The coats of the vessel were more intimately adherent to each other than in a natural state; but it was evident that the sac consisted in a dilatation of the internal, the

middle, and the external coats of the aorta. In the large aneurism, the disorganized internal and middle coats could be traced for some distance into the sac, when the parts contained in the posterior mediastinum and the vertebrae formed the remainder of the cyst. There can be little doubt that this sac commenced in a dilatation of coats of the vessel similar to those appearances which existed in the superior portion of the artery, and the dissection appeared to illustrate the formation of aneurism, by partial dilatation of the coats of the artery in three distinct stages.

RENÉ-THÉOPHILE-HYACINTHE LAENNEC

(1781-1826)

FOR OUR modern understanding of the anatomic changes wrought by tuberculosis we are indebted above all others to RENÉ-THÉOPHILE-HYACINTHE LAENNEC. This one man, a consumptive himself, in the span of a short and fevered life, correlated for the first time in a wholly logical way the varied and diverse changes in this destructive disease. A pupil of Corvisart and a close observer of the work of his older fellow pupil Gaspard-Laurent Bayle, from the outset he devoted himself to a field notably developed by both of these men, viz. diseases of the heart and lungs. In 1819 he brought out his celebrated "*Mediate Auscultation*," in which the physical signs of pulmonary disease in the living patient, as elicited by percussion and his own invention the stethoscope, are described, with a close correlation with the pathological change as brought out by subsequent dissection. Later editions soon followed, and as the greatest monograph on the subject, this work was eagerly received and widely read in the original and translation. While that portion on tuberculosis has been most remembered, there is almost as much merit in the sections devoted to other pulmonary pathology, very little of which escaped Laennec's keenly observant eye in the course of his energetic, painstaking study. The selection here reproduced is the chapter on *Pulmonary Phthisis* in the "*Traité de l'auscultation médiate*," 1819.¹

ON TUBERCLES OF THE LUNG

The cavities producing pectoriloquy are those vulgarly known as *ulcers of the lung*. They are not, as was long supposed, and is still believed by the majority of medical practitioners, an outcome of inflammation and suppuration of the pulmonary tissue. The recent advances in pathological anatomy have proved beyond all manner of doubt that these cavities are due to the softening and subsequent evacuation of a peculiar kind of accidental formation which modern anatomists have specially designated by the name

¹ Translation by Sir William Hale-White, Medical Classics Series, London, 1923.

tubercle, formerly applied without distinction to any sort of unnatural protuberance or tumour.

The presence of tubercles in the lung is the cause, and constitutes the peculiar anatomical characteristic of pulmonary phthisis.

The cavities produced by tubercle differ essentially from an ulcer, inasmuch as this spreads by eating into the tissue in which it is formed, whereas the first are produced by the spontaneous destruction of accidental formations which have pushed aside and compressed the pulmonary tissue, but not destroyed it, and have no tendency to increase at its expense.

The manner in which these morbid formations develop has been described by M. Bayle with much greater completeness and precision than had ever been achieved before. However, certain observations made since the publication of his *Researches* having enabled me to rectify or extend some of his remarks, I esteem it requisite, for the understanding of many things I shall have to say, to set forth in an abridged form the characteristics and mode of development of tubercles, points upon which I might otherwise have referred to the excellent work quoted above.

The tubercles develop in the form of small semi-transparent granules, grey in colour, though occasionally they are entirely transparent and almost colourless. Their size varies from that of millet-seed to that of hemp-seed; when in this state they may be termed *miliary tubercles*. These granules increase in size and become yellowish and opaque, first in the centre and then progressively throughout their substance. Those nearest together unite in the course of growth and then form more or less voluminous masses, pale yellow in colour, opaque, and comparable, as regards density, with the most compact kinds of cheese; they are then called *crude tubercles*.

It is usually at about this stage in the growth of the tubercles that the pulmonary tissue, healthy up till now, begins to harden and to become greyish and semi-transparent around the tubercles owing to the fresh growth of tuberculous matter in its early or semi-transparent stage which infiltrates it.

Sometimes indeed tuberculous masses of great size are formed as a consequence of this impregnation or infiltration without any previous development of miliary tubercles. The pulmonary tissue thus congested is dense, moist and quite impermeable to air; when it is cut the incisions reveal a smooth polished surface. As these

indurations gradually pass into the state of crude tubercles we may observe the appearance in them of a multitude of minute opaque yellow specks which multiplying and growing larger end by invading the whole of the hardened part.

In whatsoever manner these crude tubercles may be formed, they finish at the end of a longer or shorter time of very variable duration by becoming softened and liquefied. This softening starts near the middle of each mass, which daily becomes softer and moister until the softening has reached the periphery and become complete.

In this phase the tuberculous matter may present itself under two different forms: sometimes it resembles thick pus, but it is odourless and yellower than the crude tubercles; sometimes it is separated into two parts, one of which is very liquid and more or less transparent and colourless unless it is contaminated with blood; the other part is opaque and has the consistency of soft, friable cheese. In this latter state, specially met with in scrofulous patients, it often bears a complete resemblance to whey in which small fragments of caseous matter are floating.

When the tuberculous matter has completely softened it breaks its way into the nearest bronchial tube. The resulting aperture being narrower than the cavity with which it communicates, both remain of necessity fistulous even after the complete evacuation of tuberculous matter.

It is exceedingly rare to find only a single cavity in a lung thus affected. Usually these cavities are surrounded with crude tubercles and miliary tubercles which soften successively, burst into the main cavity and give rise to the anfractuosités generally to be observed in it, and which in some cases spread step by step until they reach the surface of the lung.

Cords or columns of dense pulmonary tissue generally permeated with tuberculous matter often traverse these cavities and somewhat resemble the fleshy columns in the ventricles of the heart; they are thinner towards the middle than at their extremities.

These columns have frequently been mistaken for blood-vessels, and I am of opinion that M. Bayle himself has at times fallen into this error, for he says that the cavities caused by tuberculosis are frequently traversed by vessels; such appears to me, on the contrary, to be very rarely the case. I have never found a blood-vessel of any real size in the interior of the said columns. M. Bayle's work, more-

over, furnished no instance of such a thing, and I only remember to have heard him once say, that when examining *post mortem* a consumptive who had died of sudden and violent haemorrhage, he had found a pulmonary vessel spanning a huge cavity, and revealing about midway a rupture, accounting for the haemorrhage to which the patient had succumbed.

In the somewhat rare cases in which I have met with blood-vessels in these columns, they formed only part of them and were almost without exception obliterated. In fact it is usually possible to trace them only for a short distance from the point at which they enter the column; after this they become indistinguishably merged in the pulmonary tissue permeated with tuberculous matter.

It would appear that the tuberculous matter, as it spreads, usually pushes aside the blood-vessels, because very large vessels are often discovered creeping along the walls of the cavities and constituting a definite part of them. These vessels are usually flattened; it is rare for them to be obliterated, but such of their ramifications as lead to the cavity or to the tuberculous masses are very manifestly obliterated, and if we cautiously inject these vessels with a coloured liquid, none of it will make its way through into the cavity. Dr. Baillie had already observed this fact, and Dr. Starck, whom he quotes, appears to have found the extremities of vessels plugged by coagulated blood.

The ramifications of the bronchi seem, on the contrary, to be usually enwrapped rather than thrust aside by the tuberculous matter, and it would also appear that the compression to which they are consequently subjected results in their swift destruction, for it is extremely seldom that any bronchi can be distinguished in the tuberculous masses, and yet it is very rare to find even a very small cavity into which there do not open one or more bronchial tubes of different diameters, and directed in such a manner as to show clearly that they originally passed right through the tuberculous mass. In hardly a single case are these tubes broken into sideways; they are severed completely by a clean cut flush with the walls of the cavity.

As the cavity gradually empties, its walls become coated with a sort of false membrane, thin, smooth, of a white colour, almost opaque, of a somewhat soft almost friable consistency, and it comes away readily when scraped with a scalpel. This membrane is generally complete, lining the whole inner surface of the cavity.

Its place is occasionally taken, however, by a pseudo-membranous exudation, thinner, more transparent, less friable, and more closely adherent to the walls of the cavity, which it usually covers only in patches. If it does happen to line the entire cavity, it presents at places much greater thickness, and this fact seems to point to its being the product of an exudation starting simultaneously at several different points.

Frequently this second membrane is found beneath the first, which is then not completely adherent and is torn at various places.

Finally, sometimes we cannot find any perceptible trace of either variety of false membrane, and the walls of the cavity are formed by pulmonary tissue, which is generally hardened, red, and infiltrated with tuberculous matter in various stages of development. Judging from these facts I am of opinion that the second kind of false membrane is merely the early stage in the development of the first; that when this is completely formed it tends to peel off, and is then expectorated in fragments and replaced by new membrane, and that this matter forms one constituent of the sputum of consumptives.

M. Bayle believes that this false membrane secretes the pus which the patients expectorate. This opinion is based on the analogy which exists between it and that which forms on the surface of blisters and other ulcers. However that may be, it appears to me clear that the greater part of the sputum expectorated by sufferers from phthisis is formed by the bronchial secretion increased because of the condition which exists in the lungs. Although I do not intend to deny absolutely that it might be formed in the cavities, I would remark that when they are lined by the soft false membrane described above, they are often completely empty, or if they contain puriform matter, this resembles much less the sputum of the patient than does that which is contained in the bronchial tubes.

Should the disease come to a standstill for a length of time there will soon be formed here and there below the false membrane, greyish white semi-transparent patches in texture like cartilage, but a little softer, and very closely adherent to the lung tissue. In the course of growth these patches coalesce, and completely line the ulcerous cavity and end by continuity of substance with the inner membrane of the bronchial tubes opening into the cavity.

When this cartilaginous membrane is completely formed it is usually white or pearl grey in colour; should it assume an apparently

reddish or purple tinge, this will be due to the thinness and semi-transparency of the membrane through which the colour of the lung-tissue itself is visible.

At times, however, even when the cartilaginous membrane is of considerable thickness, its inner surface is pink or red, and this colour cannot be removed by washing; it is probably due to the presence of a network of fine vessels, although no distinct vessels can be discerned, doubtless because of their minuteness.

In a few rare cases tubercles are found completely softened, or very nearly so, in the midst of thoroughly crepitant pulmonary tissue; in such cases (I have encountered only two or three in the course of eighteen years) the walls of the cavity are quite smooth and seem to be formed only of the pulmonary tissue slightly compressed without any kind of accidental membrane.

We shall recur later to the formation of cartilaginous membrane in the cavities of the lung, and to certain similar products sometimes occurring in the same circumstances.

I have never observed these, whether primary or secondary, passing into an osseous state; only on rare occasions have I found them of a consistency equal to that of diarthrodial cartilage. M. Bayle appears to have sometimes encountered cases of ossification.

Sometimes, but very rarely, this semi-cartilaginous membrane is present before the softening of the tubercles, and the date of its formation appears to be as old as that of the tubercles themselves; the condition constitutes the encysted tubercles referred to by M. Bayle.

The texture of these cysts approximates very closely to that of cartilage, though not quite as solid; they are consequently to be classed amongst the imperfect cartilaginous formations which I have described elsewhere. Their external surface is closely adherent to the parts surrounding them, from which they can only be separated by cutting or tearing. The tuberculous matter, until completely softened, likewise adheres to them very closely, but can be detached, when the inner surface of the cyst will be found smooth and polished, although uneven and sometimes rugged. Encysted tubercles are more frequently met with in the bronchial glands than in the lung tissue itself.

What we have just described is the usual but not the only manner of development of tubercles. They are formed also in two other ways which probably correspond only to diversities in the progress

of the tubercular disease, but present sufficiently marked divergencies to deserve notice.

Occasionally, in a lung presenting tubercles in various stages of development, there are to be found small portions of lung tissue infiltrated with a gelatinous matter, moist rather than liquid, semi-inspissated, transparent, and slightly greyish in colour or tinged with blood. In these infiltrated portions the air-cells are no longer distinguishable, but there may be seen an immense number of tiny yellowish-white opaque specks, evidently formed by tuberculous matter which has already reached the second stage and around which the grey tissue constituting the first stage is not to be seen.

The second mode of abnormal development of tubercles likewise appears to occur without the previous formation of grey tissue; or, at least, if it exists, the transition from the first to the second stage is so rapid that I have never been able to observe the first.

This variety appears under the following aspect: we find here and there in the lung yellowish-white tuberculous masses, but much paler, duller, and less distinct from the lung tissue than ordinary crude tubercles. These masses are irregular, angular, and never have the more or less rounded shape of ordinary tubercles. Like the variety described in the previous paragraph and the diffused grey matter to which we referred in paragraph 30, they appear to be the result of a kind of infiltration of the lung tissue with tuberculous matter, whereas the rounded tubercles are extraneous bodies which compress and push aside the lung tissue in all directions rather than penetrate it; these masses might therefore be fittingly designated by the term *tuberculous infiltration of the lung*. They sometimes occupy a considerable portion of a lobe, but even when they reach the surface of the lung they do not cause any protuberance and in nowise alter its shape; as they grow they assume the yellow colour of the other tubercles, and end by softening in the same manner.

The three modes of development just described are frequently observable in the selfsame lung. Sometimes I have observed the last mentioned in lungs affected with peripneumonia, and even in the hepatized portion. The small number, limited extent and very pale colour of the tuberculous masses made it evident that they were of recent formation, but from this we must most certainly not conclude that the tubercles were the outcome of inflammation, for besides such a case being extremely rare when compared with the frequency of hepatization of the lung, I have also found the same

variety of tubercles at the same stage in patients whose lungs were in all other respects perfectly healthy. M. Bayle has moreover proved conclusively that tubercles cannot be regarded as a result of the termination of inflammation.

It cannot, indeed, be denied that peripneumonia, both acute and chronic, is sometimes co-existent with tubercles: it is even probable that it may occasion their development in patients already predisposed; whereas, in other cases, the irritation set up by the presence of tubercles, in appreciable numbers, may determine peripneumonia.

We cannot but give credence to these two possibilities, in view of repeated post-mortem examinations; on the other hand, a multitude of facts shows that the development of tubercles is the outcome of some general condition, that it most often takes place without any previous inflammation, and that when inflammation is coincident with tubercular disease, it is usually of a later date.

In order to be convinced of the correctness of the last assertion, it is only necessary to consider the development of tubercles in scrofulous glands. These glands are often seen to swell up and to remain for a very long while in this condition, without any redness either of the adjacent skin, or of the gland tissue itself.

Frequently it is only after a lapse of several years that signs of inflammation supervene, and it then appears to hasten the softening of the tuberculous matter. At times, however, this softening and even the perforation of the skin and evacuation of the soft matter, take place without it being possible to distinguish any genuine trace of inflammation. When inflammation does supervene its seat is manifestly in the parts adjacent to the tuberculous gland, but not in the gland itself.

A no less cogent proof is deducible from the simultaneous existence of tubercles in several organs. With sufferers from phthisis it is rare that the lungs alone should contain tubercles; they are almost invariably present at the same time in the walls of the intestines where they provoke ulcers which are the cause of the profuse diarrhoea which frequently accompanies pulmonary phthisis.

Perhaps there is no single organ that is immune from the development of tubercles and that is not occasionally found infected with them in cases of phthisis. The following is a list of the organs in which I have discovered them, arranged approximately in the order of the frequency with which tubercles occur in each: the bronchial and mediastinal glands, the cervical glands, the mesenteric glands, the

glands situated in all other parts of the body, the liver, in which the tubercles form masses of great volume but rarely soften completely, the prostate in which the tubercles do soften frequently, and after evacuation into the urethra leave cavities of varying extent. The surface of the peritoneum and pleura, in which the tubercles are small and few in number and are usually found in the grey, semi-transparent or crude state, and invariably result in death by dropsy before they have become completely softened; the epididymis, the vas deferens, the testicle, the spleen, the heart, the uterus, the cerebrum, the cerebellum, the thick part of the cranial bones, the bodies of the vertebrae, or the intervertebral substance between the vertebrae themselves, and their ligamentous appendages; the thick part of the ribs; and finally tumours of the kind usually classed indiscriminately under the general term of *scirrhus* or *cancer* in which the tuberculous matter is found intimately pervading the whole growth, or separated into isolated clearly differentiated masses amidst one or more accidental formations of other kinds.

It is rarer for tubercles to make their appearance in the muscles of voluntary movement than in any other part. The most remarkable case of this kind I have seen is that of a phthisical patient who presented tubercles in all of the organs I have enumerated above, and in whom, in addition, the ureters, so dilated that it was possible to introduce the thumb into them, were coated internally with a layer of closely adherent tuberculous matter apparently produced by the conversion of their lining membrane into tubercles. The lower extremity of one of the sterno-mastoid muscles was also converted into solid, consistent tuberculous matter. The form of the muscular fasciculi was still preserved even in the parts most completely transformed; in those which were less altered and which blended imperceptibly with the healthy portion of the muscle, the tuberculous matter was in the grey semi-transparent stage.

The patient, whose case I had followed throughout, had never complained of pain in the neck; all that he experienced was a certain difficulty in moving this part, the lymphatic glands of which were filled with tubercles and greatly enlarged.

Almost all the observations recorded in M. Bayle's work furnish examples of simultaneous development of tubercles in various parts of the body, almost always without any pain having been experienced in the parts affected, and without the presence of any other symptom indicative of inflammation. The same thing may be said

of tubercles in the lung; with scarcely an exception they produce no alteration of health until they have become numerous and large.

From these facts we are either bound to admit that tubercles are not in any sense a product or ultimate consequence of inflammation, or we must make up our minds to use this word in a sense as general and vague as we give to the word *irritation*; or even to view it as a synonym of *cause*, to do this appears to me to be of no advantage. Enough obscurity already exists regarding the aetiology of diseases, without adding still further to it by any strained comparisons.

What has just been said of inflammation is equally applicable, as M. Bayle has excellently shown, to the various general or local affections to which the cause of pulmonary phthisis has been attributed, as, for example, syphilis, whooping cough, scurvy, eruptive maladies, haemoptysis and catarrh; these various affections merely hasten the development of already existent tubercles. I think we might go as far as to agree that they sometimes determine the development of tubercles, but only in the case of persons already predisposed. Even in such cases they furnish the occasion and are not the cause; the real cause, as is true of all diseases, is probably beyond our ken.

M. Bayle does not appear to have been well acquainted with the various manners in which tubercles develop as above described. This is due especially to the fact that he had not sufficiently appreciated the grey, semi-transparent tissue constituting tubercles in the crude stage. Several of his detailed observations, e.g., vi, xii, xiii, and xxiv bis, show, however, that he had caught some glimpse of it, but without very clearly realizing the possible connections or differences between this grey, semi-transparent matter and the yellow, opaque tubercles.

Struck, no doubt, by their special characteristics he was, on the contrary, impressed by tubercles of the miliary variety which are perfectly transparent, and which he has described by the name of *miliary granulations*. These tubercles constitute indeed a very noteworthy variety owing to their colourless transparency, almost perfectly spherical or ovoid shape, smooth glistening surface, great firmness, uniform bulk, and their innumerable numbers distributed either throughout the whole of the lung, which is often otherwise perfectly healthy, or throughout a large tract of that organ; although they are never found forming groups of several together. They have the appearance of having all come into being on the self-

same day, and usually no single one of them is visibly in a more advanced state than any other.

However, M. Bayle is clearly mistaken when he regards these granulations as a species of accidental formation different from the tubercles. Particularly is he mistaken in looking upon them as a sort of cartilage, for, if his opinion had any basis in truth, we should sometimes observe them passing into the osseous state: but this has never been seen. If we scrutinize them attentively we shall be convinced, on the contrary, that they become converted into yellow, opaque tubercles: indeed, there may be observed in the centre of the less transparent a yellow opaque speck, the unmistakable sign of the beginning of this transformation. M. Bayle himself gives a remarkable instance in point.

There are also other cases in which the lungs are found filled with very small tubercles, all of much the same dimensions, but yellow, opaque, and frequently in a stage of softening already well advanced. M. Bayle furnishes us again with a very characteristic instance of this kind; and although he warns us not to confound such miliary tubercles with miliary granulations, there appears to me to be no doubt whatever that the only difference between the two is that existing between a ripe and an unripe fruit. Miliary granulations are not often elsewhere than in the lungs to be seen, simultaneously with other bulkier tubercles, at a stage so advanced that their character admits no dispute.

The development of tubercles in the various organs supplies another series of facts which go to prove that in their first state, and when still freshly formed, these accidental products are transparent or semi-transparent, colourless or slightly grey in tint. The tuberculous granulations observable on the surface of the pleura or of the peritoneum are at times colourless and perfectly transparent, at others grey and only semi-transparent. In both states they often exhibit a yellow opaque spot at their centre; occasionally they are even to be found converted into more or less softened tuberculous matter. It is not unusual to see all these different stages of development in the same membrane. The ulcers so frequently met with in the intestines of phthisical subjects generally exhibit in their deepest part miliary tubercles presenting the same varieties of colour and transparency. This tissue of lymphatic glands containing tubercles presents in the immediate neighbourhood of these formations a slight semi-transparency and a pearl-grey hue, a sure precursory

sign of the impending complete conversion of the gland into the tuberculous matter. Finally, M. Bayle has found the spleen full of small greyish bodies which he himself regards as tubercles.

In addition to the stages of development above described, certain accidental causes may intervene to modify the colour of the tubercles. Jaundice will give them a yellow tint, especially on the surface; this is particularly noticeable in tubercles of the liver. When gangrene occurs in proximity to them, it imparts a brownish or dirty brown tinge; sometimes they are contaminated in places with black pulmonary matter, and their yellowish whiteness is flecked with a few black or grey opaque dots.

The tubercles forming in the bronchial glands (which, as is well known, are of an inky black colour in almost every adult person) are often stained black in places, and this black tint, like the shade in a pencil drawing, is very dark at certain points, and resolves itself as it spreads into component dots, and finally fades imperceptibly away.

Most miliary tubercles, whether they be semi-transparent or already yellow and opaque, show towards their centre a small black point composed of the same matter; this usually vanishes as the tubercle increases in size. We must not confound this accident with melanosis of the lung, as we shall show when we come to discuss that affection.

When there is a large number of tubercles in the lung, even though they may be very minute, death sometimes supervenes before any have reached such a stage of softening as to permit the tuberculous matter to force its way through into the bronchi and give rise to an ulcerous cavity.

When, on the contrary, the tubercles are few in number, they are sometimes found, on post-mortem examination, to be all excavated; but in the majority of cases, the development of tubercles is evidently successive, and there will be found in the same lung tubercles in all the four stages of evolution we have described, viz., (i) in the form of grey or colourless semi-transparent granulations; (ii) grey tubercles of larger volume and already yellow and opaque at the centre; (iii) yellow opaque tubercles which are still firm; (iv) tubercles which have turned soft, especially about their centres; (v) cavities which have been more or less completely evacuated.

We shall see, in the second part of this work, the signs by which it is possible to diagnose the presence of crude tubercles in the lung; exploration of the voice reveals their presence only when their excavation has begun.

Fig. 1.

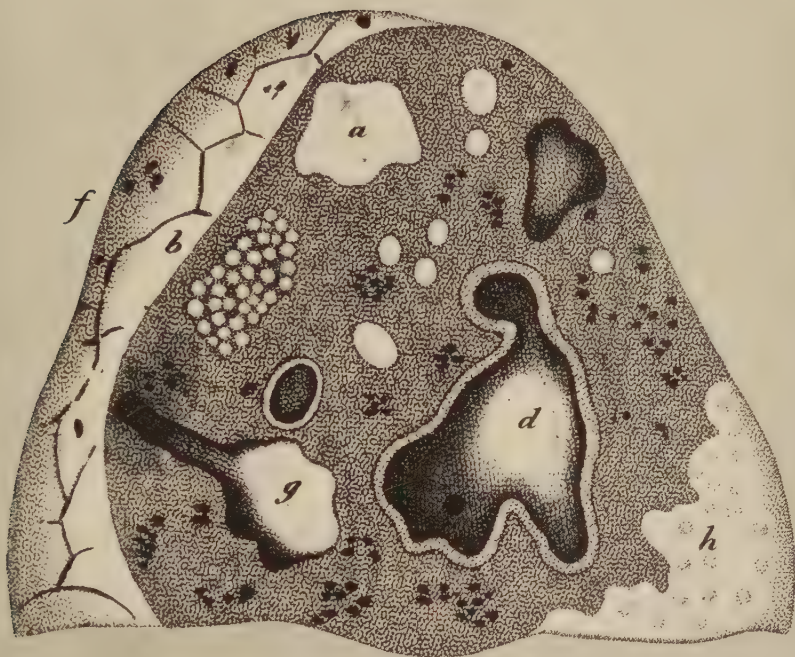


PLATE 15. FIGURE ILLUSTRATING LESIONS OF TUBERCULOSIS. FROM
THE "MEDIATE AUSCULTATION" OF RENÉ-THÉOPHILE-HYACINTHE
LAENNEC (1819).

RICHARD BRIGHT

(1789-1858)

FEW EPONYMIC terms are as well known and widely used as "Bright's disease," which takes its origin from the classic account of nephritis in the "Reports of Medical Cases" by RICHARD BRIGHT of Guy's Hospital in 1827. Bright was led into his celebrated study, which consumed ten years before he published its results, through an inquiry into the nature of dropsy. Carefully separating out a group of dropsies in which there was obvious associated failure of the heart or cirrhosis of the liver, he was left with a set of cases which would have seemed of independent nature, had he not noted that in this remnant there was usually coincident abnormality of the kidneys. Bright finally drew a clear relationship between albuminuria, edema and renal disease. Having thus traced the first two abnormalities to the last, he next attempted to correlate all the types of damage in the kidneys he observed. He finally concluded that these many and varied forms represented merely three stages of development of one and the same process, commencing with a softening and mottling, followed by enlargement and infiltration (the stage in which albuminuria and dropsy were most pronounced), and ending with hardening and contraction. The section on disease of the kidneys forms only one division of the comprehensive "Reports of Medical Cases," and is entitled "Cases Illustrative of Some of the Appearances Observable on the Examination of Diseases Terminating in Dropsical Effusion." The text is fresh, concise and clear, and the work is beautifully illustrated with colored plates. The following are selections from it.

The morbid appearances which present themselves on the examination of those who have died with dropsical effusion, either into the large cavities of the body or into the cellular membrane, are exceedingly various: and it often becomes a matter of doubt how far these organic changes are to be regarded as originally causing or subsequently aiding the production of the effusion, and how far they are to be considered merely as the consequence either of the effusion or of some more general unhealthy state of the system. If it were possible to arrive at a perfect solution of these questions, we

might hope to obtain the highest reward which can repay our labours,—an increased knowledge of the nature of the disease, and improvement in the means of its treatment.

One great cause of dropsical effusion appears to be obstructed circulation; and whatever either generally or locally prevents the return of the blood through the venous system, gives rise to effusions of serum more or less extensive. Thus, diseases of the heart which delay the passage of the blood in the venous system, give rise to general effusion, both into the cavities and into the cellular tissue. Obstructions to the circulation through the liver, by causing a delay in the passage of the blood through the veins connected with the vena portae, give rise to ascites. The pressure of tumours within the abdomen preventing the free passage of blood through the vena cava, gives rise to dropsical effusion into the cellular tissue of the lower extremities: and not unfrequently, the obliteration of particular veins from accidental pressure is the source of the most obstinate anasaruous accumulation.

These great and tangible causes of hydropic swellings betray themselves obviously after death, and are often easily detected during life;—yet they include so great a variety of diseases, that they still present a very wide field for the observation of the Pathologist. The different diseases of the heart and of the lungs on which dropsy depends, and the various changes to which the liver is subject rendering it a cause of impediment to the circulation, are still open to much investigation. In fatal cases of dropsy we likewise find the peritoneum greatly diseased in various ways; frequently covered with an adventitious membrane more or less opaque, and capable of being stripped from the peritoneum, which is then left with its natural shining and glossy appearance. At other times the peritoneum is itself altered in structure, or is affected with tubercular or other diseases, presenting an accumulation of morbid growth.

There are other appearances to which I think too little attention has hitherto been paid. They are those evidences of organic change which occasionally present themselves in the structure of the KIDNEY; and which, whether they are to be considered as the cause of the dropsical effusion or as the consequence of some other disease, cannot be unimportant. Where those conditions of the kidney to which I allude have occurred, I have often found the dropsy connected with the secretion of albuminous urine, more or less coagulable on the application of heat. I have in general found that the

liver has not in these cases betrayed any considerable marks of disease, either during life or on examination after death, though occasionally incipient disorganization of a peculiar kind has been traced in that organ. On the other hand, I have found that where the dropsy has depended on organic change in the liver, even in the most aggravated state of such change no diseased structure has generally been discovered in the kidneys, and the urine has not coagulated by heat. I have never yet examined the body of a patient dying with dropsy attended with coagulable urine, in whom, some obvious derangement was not discovered in the kidneys.

Whether the morbid structure by which my attention was first directed to this subject, is to be considered as having in its incipient state given rise to an alteration in the secreting power, or whether the organic change be the consequence of a long continued morbid action, may admit of doubt: the more probable solution appears to be, that the altered action of the kidney is the result of the various hurtful causes influencing it through the medium of the stomach and the skin, thus deranging the healthy balance of the circulation, or producing a decidedly inflammatory state of the kidney itself:—that when this continues long, the structure of the kidney becomes permanently changed, either in accordance with, and in furtherance of, that morbid action; or by a deposit which is the consequence of the morbid action, but has no share in that arrangement of the vessels on which the morbid action depends.

The observations which I have made respecting the condition of the urine in dropsy, are in a great degree in accordance with what has been laid down by Dr. Blackall in his most valuable treatise.

Where anasarca has come on from exposure to cold, or from some accidental excess, I have in general found the urine to be coagulable by heat. The coagulation is in different degrees: it likewise differs somewhat in its character: most commonly when the urine has been exposed to the heat of a candle in a spoon, before it rises quite to the boiling point it becomes clouded, sometimes simply opalescent, at other times almost milky, beginning at the edges of the spoon and quickly meeting in the middle. In a short time the coagulating particles break up into a flocculent or a curdled form, and the quantity of this flocculent matter varies from a quantity scarcely perceptible floating in the fluid, to so much as converts the whole into the appearance of curdled milk. Sometimes it rises to the surface in the form of a fine scum, which still remains after the boiled fluid has

completely cooled. There is another form of coagulable urine, which in my experience has been much more rare; when the urine on being exposed to heat assumes a gelatinous appearance, as if a certain quantity of isinglass had been dissolved in water. I have indeed met with this in one or two cases only.

During some part of the progress of these cases of anasarca, I have in almost all instances found a great tendency to throw off the red particles of the blood by the kidneys, betrayed by various degrees of haematuria from the simple dingy colour of the urine, which is easily recognized; or the slight brown deposit;—to the completely bloody urine, when the whole appears to be little but blood, and when not unfrequently a thick ropy deposit is found at the bottom of the vessel.

Besides these cases of sudden anasarcaous swelling being generally accompanied by coagulable urine, I have found another and apparently a very opposite state of the system prone to a secretion of the same character; namely, in persons who have been long the subjects of anasarca recurring again and again, worn out and cachectic in their whole frame and appearance, and usually persons addicted to an irregular life and to the use of spirituous liquors. In these cases the albuminous matter has coagulated, in the more ordinary way, in flakes and little curdled clots; but instead of rendering the whole milky, the flocculi often incline to a brown colour, looking like the finest particles of bran more or less thickly disseminated throughout the heated urine. Occasionally in these cases the urine has been much loaded with saline ingredients becoming turbid by standing, but rendered quite clear by the application of a much lower degree of heat, than is necessary to coagulate the albumen.

In all the cases in which I have observed the albuminous urine, it has appeared to me that the kidney has itself acted a more important part, and has been more deranged both functionally and organically than has generally been imagined. In the latter class of cases I have always found the kidney decidedly disorganized. In the former, when very recent, I have found the kidney gorged with blood. And in mixed cases, where the attack was recent, although apparently the foundation had been laid for it in a course of intemperance, I have found the kidney likewise disorganized.

It is now nearly twelve years since I first observed the altered structure of the kidney in a patient who had died dropsical; and I have still the slight drawing which I then made. It was not however

till within the last two years that I had an opportunity of connecting these appearances with any particular symptoms, and since that time I have added several observations. I shall now detail a few Cases, beginning with the two first, in which I had an opportunity of connecting the fact of the coagulation of the urine with the dis-organized state of the kidneys.

CASE XIV

Leonard Evans, a Welshman of remarkably stout frame: about ten or twelve years ago said to have been the strongest man out of 1400 in Deptford dockyard; has enjoyed much good health till about two years ago, when he had the syphilitic disease; but this was completely subdued. His occupation of late has been one which has exposed him very much to alternations of heat and cold,—being a journeyman currier; in some part of which business he has often been exposed to cold, when in a state of most profuse perspiration; but his habits have been very sober and steady throughout life. The day before his attack,—about ten days before his admission into Guy's Hospital,—he had been employed in washing skins; his feet were very wet: he found the swelling coming on about six o'clock the same evening, and he continued to swell till the time of his coming into the Hospital, under my care, Nov. 15th. He was at that time labouring under general anasarca to a great extent. Urine very scanty. He had taken very little medicine.

Sumat Extract. Elaterii gr. fs. sexta quaque hora.

18th. The swelling rather diminishes.

Extract. Elaterii gr. j. bis quotidie.

19th. The pills have purged him very often, with much pain before they act, and much sickness. Pulse 80, full. Urine rather increased: today he first observed the dark-brown tinge in the urine, which is now very obvious, being a mixture of the red particles; *coagulates by heat*.

Rep. Extractum Elaterii mane quotidie.

20th. Urine three pints and a half in twelve hours, which is nearly six times as much as he had passed before; slightly coagulable; turbid, with red particles; feels altogether much relieved: one very copious watery and faeculent dejection.

Sumat Infus. Spartii scoparii lbij quotidie. Habeat pulverem ex Jalapae Radice et Potassae Supertart. alternis auroris.

21st. Swelling a good deal reduced; urine in sixteen hours six pints and a half, of a high brandy colour; does not coagulate.

Repetantur Medicamenta.

24th. Urine six pints from 8 o'clock last night to 8 o'clock this morning, lighter-coloured; scarcely coagulates.

27th. Urine still contains some red particles, and is copious, but does not coagulate; swellings diminish daily.

Extr. Conii gr. v, ter die. Repetantur medicamenta.

Dec. 1st. Complains of a pain under his jaw, but the edematous swellings are nearly gone, except a little on the instep. Urine four pints, coagulates, and contains much blood, looking quite red; three stools yesterday from the powder. Pulse 84, of good strength.

Mittatur sanguis ad $\text{f}\text{x}\frac{1}{2}$. Rep. Infusum et Pulvis.

2nd. Blood not buffed, but a firm and large coagulum, quite elastic, like a mould of jelly, and of florid colour. Urine about four pints, very red, with a great quantity of ropy mucus deposited at the bottom. Edema much subsided. Bowels not yet opened by the powder.

Rx Antimonii tartarizati gr. $\frac{1}{2}$, Opii purificati gr. ij, Theriacae q. s. Fiant Pilulae ij, quarum sumat unam bis quotidie Omitt. Infus. Spartii; habeat Haustum Sennae pro re nata.

3rd. Blood with thin buff; complains of a sore throat; reports the urine which has been thrown away to be of the same colour as yesterday. He is walking about, and appears much improved upon the whole.

Liniment Ammoniae gutturi infricandum. Repetantur medicamenta.

4th. Urine decidedly less red, but less copious; about two pints, mucous matter at the bottom diminished; it coagulates much more sparingly; throat relieved; he looks rather pallid; tongue moist and clear; pulse moderate.

5th. The whole of yesterday afternoon he seemed well,—was walking about the ward, and seemed comfortable: he slept soundly, but this morning at seven o'clock suddenly complained of a great difficulty of swallowing and breathing, and constriction at his throat and chest. Fourteen ounces of blood were taken from his arm, sixteen leeches were applied to his throat, and an emetic was administered; but all was unavailing,—and at about eleven o'clock he expired: the blood was highly buffed. I was informed that the

urine passed since I saw him was somewhat further improved in appearance.

As I felt assured that this was a case in which neither the general circulation through disease of the heart, nor the biliary secretion through disease of the liver had any direct influence in the production of the Anasarca, but could not doubt that the kidney was more immediately the seat of the derangement,—I was very desirous of obtaining an examination, to ascertain whether any change had taken place in that organ, which could betray itself to the eye; and this was at length granted, at the late residence of the patient, about sixty hours after death.

Sectio Cadaveris

No sign of effusion of serum into the cellular membrane of the integuments; muscles of the body unusually strong; limbs rigid. Lungs rather gorged with blood; otherwise in structure quite healthy. Heart and pericardium quite healthy. In the cavity of the chest on each side about four ounces of fluid; in the right cavity the serum of a red colour, the lung adhering by old adhesion on the front part, and there was great congestion of blood in the back part by subsidence after death.

The liver rather gorged with blood, but perfectly healthy in structure. Spleen so soft that when the tunic was lacerated, the substance of the viscus flowed out of a chocolate colour. Stomach and intestines healthy; no effusion of serum into the cavity. The bladder contained about three quarters of a pint of clear and yellow urine, which was not coagulable, or at least yielded only the slightest flaky coagulum; but some mucus had subsided to the bottom. The KIDNEYS presented a very curious appearance; they were easily slipped out of their investing membrane, were large, and less firm than they often are, of the darkest chocolate colour, interspersed with a few white points, and a great number nearly black; and this, with a little tinge of red in parts, gave the appearance of a polished fine-grained porphyry or greenstone. On cutting longitudinally into the kidney, this structure and these colours were found to pervade the whole cortical part; but the natural striated appearance was not lost, and the external part of each mass of tubuli was peculiarly dark; the whole mammillary processes were also of a dark colour. On being cut through and left for some time, a very considerable quantity of blood oozed from the kidney,

showing a most unusual accumulation in the organ; and indeed it seemed to be from this cause that the peculiar appearance and colour arose; the very dark spots being the effect of blood either extravasated or in vessels greatly gorged. I had an opportunity of procuring very faithful drawings of the kidney. [Plate 16]. We next examined the epiglottis; and this we found to be thickened by an edematous effusion beneath the membrane on its upper side: it was bent into the form of a penthouse with a sharp angle; and the lower surface was also thickened, and presented a doubtful appearance of superficial ulceration. When the epiglottis was cut into, a considerable quantity of serous fluid was easily squeezed out; and on the whole the opening was much contracted, and the epiglottis completely disqualified for performing its natural valvular functions.

There could then be no doubt of the nature of the attack under which the patient sunk so rapidly: inflammation of the epiglottis had been followed by edema of that part which had produced suffocation.

* * *

In this case we have the most unequivocal proof of the derangement of the kidney being connected with the extensive and sudden occurrence of anasarca:—there could indeed be no doubt of this, from the first moment that I had an opportunity of seeing the patient. The coagulable urine,—and that urine already containing the red particles of the blood in large abundance,—led me from the beginning to form my opinion as to the seat of the disease. Moreover, dissection showed no other adequate cause for the dropsical affection: and as during life no suspicion could be entertained that either the liver, the intestines, the heart, or the lungs were diseased, so the examination showed all these organs to be in a state of perfect health. I feel that it may be matter of doubt how far the employment of diuretics during such diseased tendency may have been instrumental in producing the peculiar appearance of the kidneys; but it is to be remembered that the particular symptom, the hæmaturia, which appears so immediately connected with this morbid state, has been observed to occur in a greater or less degree under all modes of treatment, and even before any treatment has been adopted in the sudden anasarca, and therefore we cannot in fairness ascribe the morbid appearance of the kidney to the remedies,—or

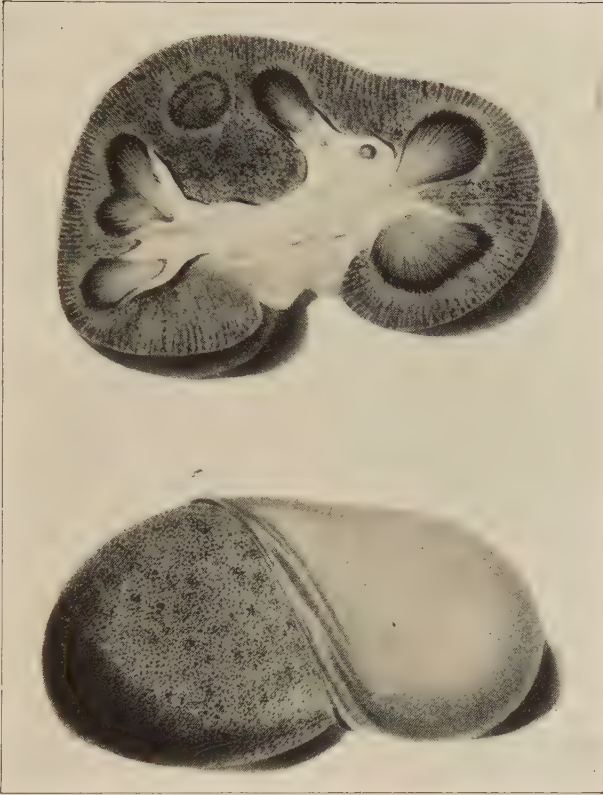


PLATE 16. NEPHRITIC KIDNEY (CASE XIV). FROM
THE "REPORTS OF MEDICAL CASES" BY RICHARD
BRIGHT (1827).

at all events we must admit a certain high degree of disease to have existed in that organ from the commencement of the symptoms; but whether to the extent discovered in this case after death or not, we can never determine. The symptom of haematuria was evidently on its decline when the accident occurred which led to a fatal termination; and it was my intention in this case, as in the case of FISH, (to be related hereafter,) to have had recourse to local bleeding by cupping from the loins, as soon as the excessive general action had been sufficiently subdued: and very possibly if the sudden affection of the epiglottis had not come on, the disease in this case would for a time at least have completely yielded, as the symptoms of anasarca had already totally disappeared, under the treatment adopted.

PIERRE-CHARLES-ALEXANDRE LOUIS

(1787-1872)

*A*MONG THE notable monographs of the Paris school in the early nineteenth century was the "*Recherches anatomiques, pathologiques et thérapeutiques sur la maladie connue sur les noms de gastro-entérite, fièvre putride, adynamique, ataxique, typhoïde, etc.*" by PIERRE-CHARLES-ALEXANDRE LOUIS. Like his great contemporaries in the Paris hospitals Louis divided the labors of a lengthy and strenuous day between the wards and the post-mortem room. Typhoid fever, or "*dothienenteritis*," was endemic and of high mortality at the time. Several of the great French pathologist-clinicians wrote extensively on the subject. The most important treatise, however, was the one by Louis, mentioned above, which appeared in 1829, and was at once received as the standard work in the subject and the basis for further investigation. In this classic both the clinical and morbid anatomical features were considered in detail. The selections below are the descriptions of the three organs most characteristically affected in the disease, the small intestine, the mesenteric lymph nodes and the spleen.¹

ELLIPTICAL PATCHES OF THE ILEUM, OR PEYER'S AGGLOMERATED GLANDS

The elliptical patches of the ileum were more or less seriously changed in structure in all the patients, in the last two or eight feet of the canal. They were so throughout the whole length of it in one case only. This alteration was found under two forms, which were very distinct, and generally recognised with great facility at the first glance. Let us examine them successively.

FIRST KIND OF MORBID CHANGE IN THE ELLIPTICAL PATCHES

This was found in the same patients in very different degrees, in different parts, being most severe in those patches which were nearest the caecum, and the least so, in those farthest from the large intestine.

¹ From the translation by Henry I. Bowditch, Boston, 1836.

In the intervals between these diseased patches were scarcely ever found any in a perfectly healthy state, which seems to indicate, as I have remarked previously, that their alterations went on in a gradual manner from the caecum to the duodenum, and did not commence simultaneously in all the places between these two spots.

The change from healthy patches to those which were altered in structure took place sometimes in a gradual manner, but generally it was the reverse; and either all or nearly all the different degrees of the lesion were found in some patients. In passing from the patches which were the least altered, to those which were the most so, or towards the caecum, the following appearances presented themselves.

The first were but very slightly elevated, and had a pale or faint rose color. The greyish points which are seen in the natural state of the patches, in nearly every patient, and which indicate the orifices of little glands or crypts, had disappeared, and the softening of the mucous membrane was very slight. After these patches, came others in which the thickening, softening and redness were progressively more marked. The first of them had in some cases a surface which was granulated, as it were, or very minutely mameloned, upon which were seen a greater or smaller number of open orifices, which occupied the parts in which the above-mentioned grey points are usually found, and they were, in fact, nothing else than the orifices of the crypts. So that in this state of the alteration the most remarkable effect of the lesion was the development and, if we may so express it, the exaggeration of the natural structure of the parts. (Obs. 1, 10, 13, 21.) Although simple inspection made this evident, we obtained a new proof of it by raising the patch itself, or rather the mucous membrane that aided in its formation, for then we saw that the elevations observed before this membrane was raised, were more or less marked upon that face of it which adhered to the subjacent parts; and, by putting the patch between the eye and the light, we saw alternately, opaque and semi-transparent points, and these last indicated the intervals between the crypts. The submucous cellular tissue was more or less thickened, of a pale rose color, analogous to that of the mucous membrane. Hence it results that the elevation formed by the patches in this first degree of alteration was caused by a thickening of the mucous membrane and of the subjacent cellular tissue.

After these patches came others which were redder, thicker, larger and softer; they had a uniform appearance, were not mameloned, had no open orifices, and the small glands, composing the patches, were no longer to be seen. They could not be raised as those previously spoken of, and the submucous tissue was likewise redder and thicker under them, than under those in which the mucous membrane was less altered.

Finally, at a greater or less distance from the caecum, the patches had ulcerations upon them, some superficial or just commencing, with an imperfect destruction of the mucous membrane; others deeper, with entire destruction of this membrane. Sometimes they were distinct from one another, at others, there were many collected on the same patch, so that the entire destruction of the mucous membrane over the whole extent of the patch was owing, at times, to the union of many small ulcerations, at others, to the gradual increase in size of one and the same ulcer.

The submucous cellular tissue, which composed the surface of the ulcerations, was in many of them very nearly in the same state as in the patches which were not ulcerated, and it had not lost any of its substance, whilst, in those nearer the caecum, it was destroyed to a depth and extent which varied on the different patches, and the muscular coat, when exposed, was more or less red and thickened, its fibres being very distinct. In some cases they were to a certain extent destroyed, and the peritoneum being ruptured, a perforation of the canal was the consequence, this perforation being generally single, but there were sometimes two of them in the same patient. Eight out of the forty-six individual cases, the lesions of which I am now analyzing, presented this affection.

Moreover, every degree of the alteration took place very rapidly in some cases, so that the perforation, which was the last period of it, occurred in one patient who died on the fourteenth day of the disease, and forty hours after the symptoms, to which it gave rise, commenced. At a future period, I shall speak again of these perforations; at present, it is sufficient to remark that they always occurred very near the caecum, in the last ten feet of the ileum, which is a consequence of the fact I have mentioned before, to wit, that the changes wrought in the patches were always greater according to their proximity to the ileo-caecal valve.

Besides their depth and extent which, as we have seen, were extremely various, the ulcerations differed from one another very

much. The circumference was generally regular, oval or rounded, but sometimes it was angular or dentated (*dentelé*), as it were, in some cases. Some, instead of having perpendicular edges, had them slanting gradually towards the adjacent parts, so that the destruction of the mucous membrane was to a much greater extent than that of the cellular tissue, which, in its turn, was more widely destroyed than the muscular coat. In some patients, likewise, the edges, instead of being well marked, had several strips of membrane attached to them which were more or less separated from the subjacent parts. (Obs. 1, 13, 31, 44.)

It was especially among the patients who died between the fifteenth and thirtieth days that this alteration, of which we are now speaking, presented all the varieties which we have mentioned. But such was not the fact in those who died before the fifteenth, or after the thirtieth day. In the former, the ulcerations were generally small in size and depth, and few in number, or there were none at all to be seen, (as in two cases,) and the elliptical patches were merely more or less red, softened and thickened in a part of the ileum. A single case of this kind was observed in a patient who died at a later period on the twenty-second day of the disease, (Obs. 22), but this is the only one which I observed among individuals in whom the progress of the disease had not been very rapid.

Among those who died after the thirtieth day, the elliptical patches, whether ulcerated or not, presented the following modifications.

Their color, which had been, as already mentioned, of a red hue, which varied in intensity, was changed to a mixture of red, of grey and of blue in various proportions, or they had a greyish or bluish appearance without any red tint, and they were not so thick, and were of a more consistent texture than the red patches were, so that the less they had of a red color the less thick and soft they were.

These different shades of color from the red to the grey, these different degrees of softening, of thickening, in the manner and according to the law of progression already stated, in cases where death took place long after the commencement of the disease, seem to me to demonstrate that these patches in which they were found had had, at a certain period of the disease, all the characters belonging to the red patches, and the differences, observed between them and these latter ones, were the consequences of a retrograde

course nature had commenced for the ultimate restoration of these patches to a healthy state. Of this we must have been convinced in the first part of this work.

The submucous tissue presented the same alterations of color, consistence and thickness, whether the patches were ulcerated or not. Those which were ulcerated had not in some of the cases any other thing remarkable about them; in others, the edges were, in certain parts, or throughout, more or less depressed, and in some the surface of the ulceration was more or less depressed, had a polished, brilliant aspect, and was covered with a very thin pellicle, which was transparent like a serous membrane, and continuous with the submucous tissue around the ulceration. It was a true cicatrice, and marked a retrograde course in the disease, and that nature had been striving some time to restore the diseased parts to health. I have found no example of this, except in cases which have proved fatal a distant period from the time at which the disease commenced; that is to say, after thirty-six, forty and forty-three days of disease. (Obs. 15, 16, 17.)

Moreover, the ulcers which were cicatrized, or only in the process of cicatrization, presented in some cases the same peculiarities which are seen in ulcerations of the skin, which are undergoing the same process. Whilst the cicatrice commenced only on one side, it seemed to have no influence upon the other, the mucous and submucous tissue being separated from the subjacent parts in a portion of the circumference of the ulcer. (Obs. 36.) I found, in one case, in the middle of a cicatrice already far advanced, the remains of mucous membrane, which indicated that upon the patch where they were seen, as upon many others not cicatrized, many ulcerations commenced at the same time.

Finally, in cases in which there were perfect or commencing cicatrices, all the ulcerations did not have them; this restoring process of nature was found only in the neighborhood of the caecum, so that as I have said above, nature followed always the same course in the production, and in the cure of the disease.

The small patches, which naturally exist in the intervals between the elliptical patches of the ileum, were sometimes affected like the other larger ones, and to the same degree. It was very nearly the same case with those which are immediately in the neighborhood of the ileo-caecal valve, and occupy, for the space of an inch and a half or two inches and a half, the whole, or nearly the whole cir-

cumference of the canal. They were more or less red or bluish, softened, thickened, ulcerated or much more perfectly confluent than when in a healthy state; but they were generally less severely diseased than the last elliptical patches of the ileum. I have likewise never seen but one case of perforation of this spot which they occupy.

MESENTERIC GLANDS

They were more or less seriously altered in size, color and consistence in all the patients, in those parts which corresponded to the elliptical patches, whether these last were ulcerated or merely red and softened. As we have already seen with relation to the patches, they were more severely diseased according to their proximity to the caecum, and as there were often remarkable differences in their aspect, according to the period at which the patient died, we must study them at these various periods.

1st. In those persons who died between the eighth and fifteenth days of the disease, their size was considerably increased; it equalled, and sometimes was greater than a hazelnut in some very near the caecum. They were of a pale rose color, sometimes streaked with dark red within, and very much softened so that the largest, which were likewise the most softened, were easily crushed by the slightest compression of the fingers. Instead of the rose color, they had a very dark red hue near the caecum, in two out of the ten subjects of the series.

2d. In patients who died between the fifteenth and twentieth days of disease, their size and softening were at least as great as in the preceding cases, their color, sometimes of a rosy hue, sometimes brown red; and in three cases many of them, in the neighborhood of the caecum had a greater or less number of yellow points in their substances. (Obs. 1, 6, 46). These points, although doubtless they were purulent, had not the least appearance of fluidity, but were very much as we see them in commencing abscesses of the liver.

The condition of the mesenteric glands therefore, in these two groups of patients, was in exact relation with the condition of elliptical patches of the ileum, so that in those cases in which the patches were but slightly, or not at all ulcerated, these glands contained no pus; and when the ulceration was more marked, the

disease of older date, pus began to appear and absolutely existed in many cases.

3. In patients who died between the twentieth and thirtieth days, I observed as follows.

The mesenteric glands were of a rose color near the caecum in two cases; of a violet red hue, more or less marked at the same part in the others; and nearly all the glands composing the patches which were but a *little altered* had the rose color which I have described as existing in the patients of the first group. In some, instead of the more or less deep amaranthine red color which they had generally, the glands were greyish, bluish or purplish; somewhat smaller and softer than in the other cases in which their size and softening were as great as in the individuals of the preceding groups. (Obs. 2, 36, 39). This state also was in harmony with that of the elliptical patches, whether ulcerated or not, which in the same cases had a similar hue, and were rather less softened than the red patches. And as these different degrees of change of color, of consistence and thickness depend upon the return of the patches towards a healthy state, we cannot doubt that the bluish, or purplish color of the glands, their volume, and their rather smaller degree of softening depended upon the same cause.

In some subjects the glands contained pus in rather larger points than in the preceding series, or it was collected in small cavities (Obs. 2, 3, 24, 32, 36), so that in certain cases we can determine the period at which death took place, by means of the mesenteric glands.

In the patients of this series, I met only one case in which the morbid change of the elliptical patches and that of the mesenteric glands were not in perfect harmony. (Obs. 22).

4th. In some patients who died after the thirtieth day of disease, the violet, greyish or bluish color predominated; so that in two of them only were the glands of a vivid red color, and these patients died in consequence of perforation of the small intestine. As a change of color had taken place, so the size and especially the softening of the glands were much less than in individuals who died during the preceding period, and this was in perfect accordance with the state of the patches, whose retrograde march was, as we have previously seen, much more advanced than in the others. And if this simple examination does not convince the reader that the state of the mesenteric glands was, as that of the patches, the

effect of a retrograde course in the disease; that they had been, at some previous time, softer and of a different color, he will be satisfied upon the point by considering that the glands, nearest the caecum, contained in two cases small collections of pus. Thus the lesion was not merely the same as in the preceding series, but it followed the same course, having been more severe near the end of the ileum than any where else.

At a future period, in the next volume, I shall give the cases of the typhoid affection, about which there may be some doubt at the first glance, and I shall likewise give the case of a patient who died on the forty-ninth day of disease, in whom there was a mesenteric gland almost wholly converted into pus, and the cavity had such very thin walls, that inevitably it would have opened into the cavity of the abdomen, had the patient died a few days later.

The mesenteric glands we have just been speaking of, were not the only ones which were altered; those which corresponded to the *healthy* elliptical patches were also diseased in rather a large number of cases; or in ten out of forty-six patients, to wit;

In 1 subject out of 10 of the first series

2 " " " 7 " " second "

6 " " " 20 " " third "

1 " " " 9 " " fourth "

But this morbid change was much less than the other, being only a greater or less increase in volume, and a more or less vivid red color, without evident diminution of consistence.

Instead of being red these glands had a bluish or greyish aspect, in one case in which the disease went its course very slowly, and this circumstance would tend to make us believe, if we remember the facts given previously, that the red color had existed before at a certain period of the disease, but that it had retrograded afterwards.

If the state of the mesenteric glands, corresponding to the diseased elliptical patches, was the evident consequence of the disease of the latter, it may be asked what was the cause of morbid changes in the glands we are now speaking of.

Although their slight affection was invariably the same, (except in one case with regard to color), the cause of it was perhaps not constant. Let us see what I observed with respect to this subject. Out of ten in whom I observed it, in four the mucous membrane of the small intestine was perfectly healthy; in the six others, it was

more or less softened; and in some of them it was evidently inflamed. In the first four cases, the state of the mesenteric glands could not be attributed to some alteration of the mucous membrane corresponding to them, which it was not possible to discover at the autopsy. And with respect to the others, it is difficult to decide, inasmuch as if we cannot deny that the state of the mucous membrane had some influence upon that of the glands, we likewise cannot be certain that such was the fact, because a state entirely similar was observed when this membrane was perfectly healthy. But in whatever manner we explain these last six cases, it is certain that the increased size and the rose color of the glands could be attributed simply to that cause only which produces so many other secondary lesions, and which has been spoken of several times in reference to those of the mucous membrane of the stomach and intestines.

SPLEEN

The spleen was not in healthy state, except in four cases; twice in patients who died between the twentieth and thirtieth days of disease, twice in those who died after this period.

Its morbid changes consisted in alterations of volume, consistence and color, which I will now lay before the reader.

SECTION I—SIZE OF THE SPLEEN

The spleen was three, four and five times as large as usual, in seventeen of the forty-six patients whose histories we study, so that often I found it eight inches long and proportionably broad. These cases were distributed in the following manner,

4	out of 10	patients of the first series
3	" "	7 " " " second "
9	" "	20 " " " third "
1	" "	9 " " " fourth "

that is to say, the proportion of cases in which the size of the spleen was considerably increased was much greater in those who died before the thirtieth day than in those who died after that period, and very nearly the same in the first three groups of patients.

In the other cases if we except ten, the spleen was double its usual size, and in some was larger. In the ten cases which are excepted, the size was natural, or less than twice as large as usual. These cases were distributed as follows,

2 in 10 subjects of the first series

5 in 6 " " " third "

3 in 20 " " " fourth "

Among the last was the single subject whose spleen seemed small, whilst in all those of the first group it was larger than usual, though not of double its usual size.

Thus the individuals who died after the thirtieth day were those in whom the size of the spleen was less frequently enlarged, and most frequently natural or nearly so.

SECTION 2—SOFTENING OF THE SPLEEN

This softening existed in different degrees in three quarters of the cases, or in thirty-four patients; consequently not quite so often as enlargement of the organ was found, and it was found throughout the whole of the organ.

When in its greatest degree, the spleen, though not cut open, allowed the finger to penetrate its substance very readily, and its parenchyma was quickly reduced to a pulpy state. This extreme softening was found in seven individuals, of whom

1 was in the first series

1 " " " second "

5 " " " third "

There was not a single example of this in those who died after the thirtieth day.

This softening was in a rather less severe degree, in seven patients, of whom

2 were in the first series

1 " " " second "

3 " " " third "

1 " " " fourth "

It was much less marked in other patients, especially in those who died at an advanced period of disease.

The spleen was natural in consistence in fourteen subjects, to wit,

1 out of 10 of the first series

1 " " 7 " " second "

8 " " 20 " " third "

4 " " 9 " " fourth "

So that the size and consistence of this organ were much more frequently natural in patients who died after the thirtieth day of disease than in those who died earlier, and, in the single case among

the former, in which its volume and softening were great, these lesions were found in their greatest degree.

But these two lesions were not always connected, or were found in different degrees in the same subject. Let us examine what I have observed in relation to this question.

In seven cases in which there was extreme softening, the size of the organ was increased in the same proportion. In those, where the softening was rather less, the size was somewhat enlarged in four out of seven; and at a still less degree of softening, the spleen was three or four times as large as usual in four subjects. Finally, it had its usual size in four other cases in which its volume was four times as large as usual, these cases being those of patients who died between the twentieth and thirtieth days of disease.

It was, therefore, in patients who died earliest, that the combination of softening with increased size of the spleen was most frequently observed.

If now we remember that the spleen was not entirely healthy, that is to say, did not have its usual size and degree of consistence in any case in which death occurred between the eighth and twentieth days of disease, and that it appeared wholly free from morbid change in four only of those who died at a later period, we must conclude that morbid changes in this organ commence at a very early period, and *very probably*, they exist in all patients, those subjects in whom no alteration was observed being among those in whom the other lesions had commenced a retrograde course, and possibly that of the spleen may have done so, inasmuch as it would in some cases probably follow the same course as other lesions.

SECTION 3—COLOR OF THE SPLEEN

The color of the spleen was not less frequently altered than its consistence and volume; but there was no constant relation existing between its different shades of color, and its other affections, as the same color was found connected nearly equally with every different degree of volume and consistence, so the changes observed in the color of the organ, like those of many other organs, were the least constant and less essential of its morbid changes.

The color was much darker than natural in half of the cases; of a very deep brownish blue, more marked internally than externally, in sixteen subjects; of a dark red, or blackish, in which the bluish tint had disappeared more or less completely in eight others. These

two shades existed in half of the patients who died between the eighth and fifteenth days of disease; in rather a larger proportion, in those who died between the fifteenth and thirtieth; and in three patients only among those who died after that period.

Although less dark than in those above-mentioned, yet the color of this organ was darker than in health in other individuals. It was natural or lighter colored than natural in nine subjects, in one of which the spleen was likewise much enlarged.

The color was uniform in all the cases throughout the organ with the exception of two cases; in one of which it was red superficially to the depth of a little less than an inch, of a much darker color farther inwards. (Obs. 36.)

To what cause shall we attribute these different lesions we have now examined? Considering merely the softening and increased size of the spleen, which were generally connected, one would be led to suppose that they were the product of inflammation, and this opinion might be strengthened by the recollection, that in some of those subjects, or in many who did not die, and whose histories I shall analyze, the spleen had been, in all probability, the seat of slight pain, which had been increased by pressure. But other facts, as it appears to me, do not allow us to stop at this conclusion. On the one hand, we cannot attribute with certainty this pain to the parenchyma of the spleen, but, on the contrary, analogy would indicate that it was caused by the distention of its membranes; there being no reason for believing that its parenchyma has sensibilities which that of other organs does not seem commonly to have even in their most acute diseases, whilst those diseases do not attack the membranes covering them. On the other hand, the most marked characteristic of inflammation, pus, was found in not a single case. I have never, moreover, found it in any subject who died of any other acute disease, in which the spleen had morbid changes similar to those which we are now considering. How can we conceive that inflammation, which was so active that it produced, sooner or later, these changes in size and softening above described, should not have given rise, in a single case, to the formation of a quantity of pus?

Doubtless it will not be said, that as the spleen is very different from other organs, we can readily conceive that inflammatory phenomena may undergo some modifications in it, and that pus may not be the consequence of them; for in the parenchyma of the

spleen are found a large number of lesions analogous to those found in other organs; the brain, likewise, whose structure differs more widely than that of the spleen from every other organ, is not less liable to the formation of pus; and, finally, a certain quantity of pus has been found at times, though but seldom, in the substance of the spleen.

Two important facts come in support of the opinion I have just given. Inflammation, it is true, sometimes invades a whole organ, but by no means is this always the fact; and when it is general, as, for example, in the whole of one lung, it is rare to find it in the same degree in every part; so that if the softening and increased size of the spleen were the effect of inflammation, the laws of inflammation would be again overthrown by this organ, since this two-fold lesion is always universal in it, and, with only one exception, I have always found softening to be in the same degree throughout. (Obs. 10.)

The other fact is relative to the perfect integrity of the membrane covering the spleen in all those cases, which it would be difficult to conceive of upon the hypothesis of an inflammation as general and as severe as that of the spleen must have been; since in the cases in which inflammation is found in other organs, the membranes covering these organs frequently partake of it. No one will answer me by saying, that the cartilaginous patches which form so often upon the surface of the spleen are the products of inflammation, since even upon this supposition, nothing would be proved in relation to acute inflammation.

We must conclude from the previous remarks that, in the present state of science, we cannot decide as to the nature of this lesion.

WILLIAM EDMONDS HORNER

(1793-1853)

THE FIRST text-book of pathology published in the United States was written by WILLIAM EDMONDS HORNER of Philadelphia in 1829. It was a well prepared work by an able physician, and reflects great credit on the state of American pathology in the early years of the nineteenth century. While largely based on the teaching of the pathological anatomists of the great Paris school, it included much original dissectional observation from Horner's experience in Philadelphia, where the author acted as adjunct professor of anatomy in the University of Pennsylvania, while at the same time performing frequent necropsies for the physicians of the city. In the preface of his "Treatise on Pathological Anatomy," (Philadelphia, 1829), Horner indicated that it was "intended especially for the use and guidance of practitioners of medicine," treating "of a department of science . . . for which there was no sufficient provision by the plan of instruction in any of the numerous medical colleges of our country." While far from being a complete treatise on pathological alterations in the tissues of the body, it made readily available to the medical profession of the United States the best teaching of the period on inflammation and its sequelae in the mucous and serous membranes and connective tissue, and the chief abnormalities likely to be encountered in the abdominal organs, heart, lungs and central nervous system. The records of many individual post-mortem examinations are included. A selection is here presented from Horner's exposition of the subject of inflammation, and a necropsy protocol is appended.

PHENOMENA OF IRRITATIONS

PHLEGMASIA

Acute inflammation, or phlegmasia, is by far the most frequent form of irritations; for it probably constitutes the beginning of ninety, out of every hundred cases of disease. When situated on the external surface of the body it is recognized by redness, swelling, heat, and pain. In parts generally, these symptoms will be presented in different degrees, according to the intensity of the irritation. Their relative proportions to one another, are also modified in a

very striking manner by the nature of the tissue affected. In the naturally vascular tissues, the redness is very much augmented in a short time; in such as are of a loose texture, so as to permit an easy distention by the afflux of fluids, the swelling is considerable; but in ligamentous structures, as they are of a hard unyielding texture, the swelling is comparatively inconsiderable, while the pain itself is very severe.

Acute inflammation terminates in several ways. Sometimes the blood which had been accumulated in a part, disappears in a short time from it, and leaves no visible traces; in this case the probability is, that the blood was confined to its regular vascular channels, and that they alone were distended by it. This termination constitutes *delitescence*.

On other occasions the red blood is infiltrated into the affected parts; either by a rupture of the vessels, or by an over distention of them, which permits a lateral percolation. In such cases, a longer period is required for its removal; and when this is finished, the inflammation is said to have terminated by *resolution*.

Again, it frequently happens, that the vital action of the parts not being sufficient to accomplish the removal of the effused blood, the latter is retained in a fluid state, while the parts affected take on a secretory action, and discharge pus. When an abscess is opened under these circumstances, the discharge is at first fluid blood; mixed with pus more or less completely elaborated, according to the period at which the opening is made; afterwards the secretion of the part is seen in a more unmixed state, and finally perfectly pure pus, being then whitish, milky, inodorous, and insipid. The termination of inflammation here, is said to be by *suppuration*.

In many cases where a surface is the part inflamed, a regular suppuration fails to be established, and a superficial erosion follows: such erosion increases in depth and in extent for a time, and then heals. This termination of inflammation is said to be by *ulceration*.

On other occasions the afflux of blood to the part ceases very gradually, the pain disappears in the same way, and also the increased heat; but the tumefaction continues to augment slowly and regularly, by a deposit of the white portions of the blood, and an indurated mass is finally left. This termination is said to be by *induration*, or *scirrhus*. And if the induration remains red, as it sometimes does in the highly vascular tissues, the termination is called red induration or hepatization. In either of the last

cases the inflammation is said to have ended in a *chronic state*.

Finally, the inflammatory action of a part is sometimes so excessive that none of the preceding terminations occur, but the part affected is absolutely killed or deprived of life. This is called the termination by *gangrene*.

Pus varies in its colour somewhat, according to the texture of the part producing it; it is therefore whitish, grey, like the leys of wine, or blackish; also it is frequently foetid: this I think occurs most commonly in empyema. Albumen is always a constituent of pus, so as to form its basis; besides which it contains some neutral salts, whose proportion varies according to the different varieties of this secretion. The presence of pus in any tissue whatever, may be considered as a conclusive proof of inflammation subsisting, or having subsisted there.

The vestiges of acute inflammation are diminished upon death, and in some measure in proportion to the rapidity of its progress during life. Besides which, it has been remarked that these traces are more readily lost in some tissues than in others; for example, more readily in the skin than elsewhere, more readily in serous membranes than in mucous. The permanency of the vestiges of inflammation in the same tissue, is also affected by certain localities; for example, they disappear from the face more readily after death than they do in other portions of the skin; from the internal coat of the stomach, more readily than from that of the intestines. They disappear also more readily after the moveable and intermittent irritations, than after such as are fixed and continued.

In a very great majority of dissections, the traces of acute inflammation are satisfactorily manifested by redness, tumefaction, softening, suppuration, ulceration, induration. And in chronic inflammations there are other marks; such, for example, as a brownish colour in mucous membranes; purulent collections, adhesions, accidental tissues, and the development of tubercles, and morbid ossifications.

DISSECTIONS, ILLUSTRATING THE PATHOLOGY OF THE THORAX

CROUP

The following dissection exhibited, with remarkable distinctness, the state of the respiratory organs in this affection. The history of it, as communicated by Dr. Jackson, the attending physician, is

as follows: E. M. a healthy, robust infant, aged one year, was seized, Feb. 1st, 1829, with catarrh and inflammation of the tonsils. Emetics and purgatives were administered; they operated favourably, and an apparent amendment ensued. On the 5th, the respiration became stridulous and laboured—venesection with the warm bath ad deliquium was practised, which again produced an abatement of the symptoms. On the morning of the 7th, Dr. Jackson was called into consultation on the case: the respiration was then exceedingly laboured; accompanied with the peculiar sound of croup; stridulous, dry, and unattended with any mucous rattle; cough dry. The tonsils were enlarged, a small ulcer on each; the fauces were red, but had no appearance of membranous exudation as is often seen in cases of croup commencing in cynanche tonsillaris.

Sixty leeches were applied to the throat, and a warm bath administered, with three grains of calomel every half hour—after the leeches, a blister to the throat. No improvement was manifested. In the evening, twenty drops of hive syrup every hour were added to the former treatment, and calomel, one grain every hour. At the same time muriatic acid was applied to the fauces by means of a brush, as recommended by Bretonneau; in the belief, that, although no exudation was discernible in the fauces, it existed in the larynx, and blocked up the glottis, into which the air was introduced with great difficulty.

8th.—Some improvement—mucous secretion established in fauces and trachea, the respiration easier and less stridulous. Mucous ronchus, or rattle, throughout both lungs; thorax resonant; pulse frequent; cheeks flushed. Blister directed to each side of the thorax—calomel, with hive syrup continued. A secretion of viscid mucus in fauces, copious during the day—and was removed by swabbing—bowels opened several times during the day; discharges dark green—pediluvium at night, with poultices to legs. During the day, infant more animated and lively.

9th.—Became much worse in the night: in exploring the chest, the mucous ronchus or rattle, that existed the previous day, had disappeared, and no respiratory murmur was distinguishable, yet the chest was resonant on percussion—respiration exceedingly laboured, and requiring strong muscular exertion—continued to grow worse, and expired suffocated towards noon.

Autopsy, February 9th, twenty-four hours after death.—Present Dr. Jackson; weather cold, and no visible putrefaction. On opening



PLATE 17. DIPHTHERITIC MEMBRANE. FROM THE
"TREATISE ON PATHOLOGICAL ANATOMY"
BY WILLIAM EDMONDS HORNER (1829).

the thorax, the lungs did not collapse, though there was no unnatural adhesion. Interlobular emphysema existed throughout the lungs, which was manifested by bubbles of air collected on their surface in clusters, and in strings or chaplets following the division of their lobuli. One of these strings traversed completely the circumference next to the ribs, of the left inferior lobe. There was also a considerable emphysema around the root of both lungs. Throughout the inferior lobe of each lung there was a high sanguineous congestion, such as exists in the acute stage of peripneumony, and which gave a solidity approaching to the sanguineous hepatization. This congestion was of a greater intensity at and about the root of the lungs. The remaining lobes were of a light spongy texture, and, except for their emphysematous state, seemed sufficiently fit to carry on respiration.

The emphysema had passed into the anterior and superior mediastinum behind the sternum, and thence below the fascia profunda cervicis, into the root of the neck, up the trachea to the larynx.

Having taken out together all the respiratory organs, and laid open the trachea and bronchia, there was found a perfect and entire lining of coagulating lymph, extending from the superior margin of the glottis, through the larynx, trachea, and bronchia, into the lungs. This membrane became thicker and thicker in its progress downwards; and could be traced satisfactorily into the secondary branches of the bronchia. It adhered with tenacity to the larynx, and upper half of the trachea, but not so much as to prevent its being pulled off in a state perfectly distinct. In the lower part of the trachea, and in the bronchia, the membrane was so loose, that it separated with the greatest facility, but retained perfectly its tubular shape.

The mucous membrane of the larynx, trachea, and bronchia, beneath this lining, was highly injected with blood, and inflamed, presenting an appearance rather rougher than common. In the bronchia it was of a scarlet colour, which increased in intensity the farther the bronchia penetrated into the lungs, until their ramifications became so small, as to prevent their being satisfactorily traced. The augmentation of colour was very abrupt, beyond the terminations of the lining membrane of lymph. The ramifications of the bronchia contained a sero-purulent fluid mixed with air. For an illustration of this case, see Plate IV. [*Plate 17 of this text.*]

THOMAS HODGKIN

(1798-1866)

THE TERM "Hodgkin's Disease" has given rise to a great deal of confusion, for which THOMAS HODGKIN, after whom the malady was named, cannot be held responsible. Hodgkin was one of that active group at Guy's Hospital in the first half of last century, who have come down to us as the "Great Men of Guy's." As curator of the museum of the Hospital and demonstrator of morbid anatomy in the medical school, he was at all times in close touch with the discoveries being made in the post-mortem room, if he did not actually make them with his own hands. In 1832 he was moved to prepare a paper "On Some Morbid Appearances of the Absorbent Glands and the Spleen," which was presented before the Medical and Chirurgical Society of London by an associate, Dr. Robert Lee, on January tenth of that year. A second section of the paper was given on January twenty-fourth. Hodgkin had no intention of defining as a pathological entity any single abnormal state characterized by simultaneous involvement of the lymph glands and spleen. He merely wished to re-emphasize a frequent association of lesions, which, as he himself stated, must have been observed repeatedly by other pathologists.

A careful analysis of Hodgkin's first paper (the second does not concern us here, as it treats simply of infarction of the spleen) in the light of modern knowledge, makes it clear that Hodgkin was dealing with cases of varied etiology, including generalized tuberculosis, one or both types of leukemia, and perhaps lymphogranulomatosis and pseudoleukemia. Nevertheless, in later years the devoted and illustrious biographer of Guy's Hospital, Samuel Wilks, appears to have considered the complex a single morbid anatomic entity, which he proceeded to stamp as "Hodgkin's Disease." A century after Hodgkin's report, however, we are still perplexed over the classification of diseases of the lymphatic system, although we have good theoretical criteria for their distinction, and the differentiation between lymphoid leukemia, pseudo-leukemia, lympho-sarcoma and what is commonly known as lymphogranulomatosis, is often difficult to establish in the individual case. In Hodgkin's time, before the development of the cellular pathology, before the normal cells were even known, in fact, and

before methods of blood examination had come into existence, any such differentiation was quite impossible, so that we can at the best today only guess at the diagnosis of Hodgkin's cases. Six of his seven cases are here reprinted. The seventh was a case of Robert Carswell's, the dissection having taken place in Paris; as the record is lengthy, it is here omitted.

ON SOME MORBID APPEARANCES OF THE ABSORBENT GLANDS AND SPLEEN

The morbid alterations of structure which I am about to describe are probably familiar to many practical morbid anatomists, since they can scarcely have failed to have fallen under their observation in the course of cadaveric inspection. They have not, as far as I am aware, been made the subject of special attention, on which account I am induced to bring forward a few cases in which they have occurred to myself, trusting that I shall at least escape severe or general censure, even though a sentence or two should be produced from some existing work, couched in such concise but expressive language, as to render needless the longer details with which I shall trespass on the time of my hearers.

CASE I

November 2, 1826. Joseph Sinnott, a child of about nine years of age, in Lazarus's ward, under the care of J. Morgan. His brother, his constant companion with whom he had habitually slept, died of phthisis a few months previously; he was much reduced by an illness of about nine months, during which time he had been subject to pain in the back, extending round to the abdomen. On his admission his belly was much distended with ascites. He had also effusion into the prepuce and scrotum. On the latter was a large ulcer induced by a puncture made to evacuate the fluid.

Head.—There was a considerable quantity of serous effusion under the arachnoid and within the ventricles. There were a few opaque spots in the arachnoid, but this membrane was in other respects healthy. The pia mater appeared remarkably thin and free from vessels. The substance of the brain was generally soft and flabby, but no local morbid change was observable.

Chest.—The pleura on the right side had contracted many strong and old adhesions, in addition to which there were extensive marks of recent pleuritis. On the left the pleura was nearly or quite free

from adhesion, but there was some fluid effused into the cavity. There was some little trace of a tubercular cicatrix at the summit of the right lung, but the substance of both lungs was generally light and crepitant, with a very few exceedingly small tubercles scattered through them.

The mucous membrane exhibited an excess of vascularity; the bronchial glands were greatly enlarged and much indurated.

The heart appeared quite healthy.

Abdomen.—There was extensive recent inflammation of the peritoneum, in the cavity of which there was a copious sero-purulent effusion, and the viscera were universally overlayed with a very soft light yellow coagulum, too feeble to effect their union, though evidently having a tendency to do so. The mucous membrane of the stomach and intestines was generally pale and of its ordinary appearance, but in some few spots it was softened and readily separated itself from the subjacent coat. The contents of the intestines were copious and of an unhealthy character, overcharged with bile. The mesenteric glands were generally enlarged, but one or two very considerably so, equalling in size a pigeon's egg, of semi-cartilaginous hardness and streaked with black matter. The substance of the liver was generally natural, but contained a few tubercles somewhat larger than peas, white, semi-cartilaginous, and of an uneven surface. The pancreas was firmer than usual, more particularly at its head, which was somewhat enlarged. The spleen was large and contained numerous tubercles. The absorbent glands about both the two last mentioned organs were much enlarged. Both kidneys were mottled with a light colour, but were free from induration. A continuous chain of much enlarged indurated absorbent glands of a light colour accompanied the aorta throughout its course, closely adherent to the bodies of the vertebrae, and extended along the sides of the iliac vessels as far as they could be traced in the pelvis. None of these vessels had been sufficiently compressed to occasion the coagulation of the contained fluids. The coats of the thoracic duct, which was large, were perfectly transparent and healthy.

CASE II

September 24, 1828. Ellenborough King, aged ten years, was admitted into Luke's ward on the 6th of August, 1828, under the care of Dr. Bright. He was the youngest of six children, of whom the first five were reported to be all healthy. This child had also been

healthy till about thirteen months ago, when his strength, flesh, and healthy appearance began to fail. He was at that time living in the west of England. A tumor was observed in the left hypochondrium in the situation of the spleen, the glandulae concatenatae on the right side were observed to be considerably enlarged, but under the treatment employed, these tumours, as well as that in the situation of the spleen, were at times very considerably reduced in size.

It does not appear that he was ever subject to hemorrhage, nor till very lately to dropsical effusion; his appetite was generally good. After his admission into the hospital the tumour on the left side was observed to extend considerably below the left hypochondrium, but was reported not to be so large as it had formerly been. The glands on the left side of the neck were swollen, as well as those on the right, the abdomen was somewhat distended, and there was considerable oedema of the scrotum.

The head was not opened.

The glands in the neck had assumed the form of large smooth ovoid masses, connected together merely by loose cellular membrane and minute vessels: when cut into they exhibited a firm cartilaginous structure of a light colour and very feeble vascularity, but with no appearance of softening or suppuration. Glands similarly affected accompanied the vessels into the chest, where the bronchial and mediastinal glands were in the same state and greatly enlarged. There were some old pleuritic adhesions. The substance of the lungs was generally healthy. There was a good deal of clear serum in the pericardium, but this membrane, as well as the heart, was quite healthy.

In the peritoneal cavity there was a considerable quantity of clear straw-coloured serum mixed with extensive, recent thin diaphanous films. The mucous membrane of the stomach and intestines was tolerably healthy.

The mesenteric glands were but slightly enlarged, and but little if at all indurated; but those accompanying the aorta, the splenic artery, and the iliacs were in the same state as the glands of the neck.

The liver contained no tubercles, and its structure was quite healthy. The pancreas was rather firm, and the glands situated along its upper edge, were as before stated, greatly enlarged. The spleen was enlarged to at least four times its natural size, its sur-

face was mammillated, and its structure thickly sprinkled with tubercles, presenting the same structure as the enlarged glands already described.

CASE III—BY H. PEACOCK, ESQ.

November 28, 1829. William Burrows, aged about thirty years. He was admitted into Naaman's ward on the 26th of September 1829, under Mr. J. Morgan, for ulcers of a scrofulous character in the axilla and neck, accompanied with general cachexia; he had previously been a patient in Samaritan's ward with secondary symptoms of syphilis, and was supposed to have taken large quantities of mercury.

About four months before his death, which occurred on the 27th of November, abdominal dropsy made its appearance.

The body was extremely emaciated, some ragged excavated ulcers were situated about the right axilla and thorax; the ulceration extended beneath the neighbouring skin, and between the pectoral muscles. The muscles of the body were pale.

The head was not examined.

The left cavity of the chest contained about a pint of serum. The lung was rather oedematous, but otherwise healthy, with the exception of some puckering and apparently chalky deposit at its apex. The lung on the right side adhered closely to the walls of the cavity, the adhesions being firm and cellular. The lung resembled that of the left side, and was also slightly disorganized at its apex. The pericardium contained about an ounce of clear and straw-coloured fluid. The heart was small and flabby.

The abdomen contained about two pints of clear serum. The stomach and alimentary canal were much distended with flatus. The liver was of a shrunken irregular shape, and was connected to the diaphragm by a few firm adhesions. Its structure was indurated, pale, and thickly pervaded with a substance having a white, hard, tuberculous character which in some parts had the form of defined rounded masses of the size of large pin heads, but for the most part was diffused. Some sections exhibited parts apparently stained with a dark ecchymosis as if from extravasated blood.

From some portions of liver seen after the inspection by Dr. Hodgkin, it appeared to him that the liver was in that state in which the acini became dense, rounded, and of a light colour, resembling small tubercles, and are readily detached: a condition of liver which

is almost peculiar to those who have laboured under a cachectic condition from mercury. The gall-bladder was small and filled with a dark coloured green bile. The pancreas was not diseased. The spleen had contracted several firm adhesions to the neighbouring peritoneum; it was enlarged to about twice its usual size, and was unusually firm. Sections exhibited its structure dense, rather dry, and of a dark red colour, but homogeneous. Dr. Hodgkin examined this spleen, a short time after its removal from the body, and found its substance generally pervaded by numerous minute translucent bodies somewhat resembling incipient miliary tubercles of the lung, but considerably smaller than these generally are.

The kidneys were pale, flabby, and slightly mottled.

A few small miliary tubercles were found in the peritoneum, about the inguinal region resembling those which have been noticed above in the liver. Some of the mesenteric glands were much enlarged and filled with a firm white deposit. The inguinal, lumbar, and aortic glands were similarly affected. The bronchial glands were in a similar state, and also extensively ossified (or loaded with earthy matter). The axillary glands were in a state of suppuration, and exposed by ulceration at the part. The thoracic duct presented nothing unusual.

CASE IV

January 8, 1830. Thomas Westcott, aged apparently about fifty years, by trade a carpenter, a patient of Dr. Addison in the Clinical Ward, admitted 30th of December, 1829. He was not at all wasted, but was rather plump than otherwise; he had a pale and peculiar, cachectic countenance, which, without minute description, may be suggested to the mind by comparing it to what is seen in some cases of confirmed disease of the spleen. The most remarkable feature in his case was the great enlargement of nearly, if not quite, all of the absorbent glands within reach of examination, but more especially in the axillae and groins. Those at the side of the neck were scarcely less so. Most of these glands which were within reach, were of about the size of pigeon's eggs, a few somewhat larger, and others rather smaller. They were of a smooth rounded or ovoid figure, and were only moderately firm, rather than indurated. An enlargement was also to be felt in one epididymis. The abdomen was distended, but the substance of the parieties appeared thick, no distinct tumour

could be felt in the region of the spleen, or in any other part of the abdomen.

The functions of the brain had been somewhat disturbed, and the left eye did not see so well as the right.

It did not appear that this patient had been liable to any particular exposure, nor could any circumstance be referred to as the exciting cause of his malady. His death took place very suddenly in the morning of the 8th, and the examination was made four hours and a half after.

The veins of the head and neck were turgid. There was no lividity of the face. There were some ecchymosed spots on one of the legs.

The arachnoid was remarkably thick and opaque. On the surface of the right hemisphere there was a diffused light rose-red colour, occupying the space of about the size of a crown piece; it appeared to depend on infiltration of the pia mater. This membrane separated readily from the surface of the brain. No morbid appearance was discovered in the substance of the brain, and no undue quantity of fluid in the ventricles. The cerebellum seemed to be proportionately, rather small.

The right optic nerve was rather smaller than its fellow.

The glands in the axillae and neck, as might have been expected, were found prodigiously enlarged, the deepest seated being in general the largest. The cellular structure around these was loose and free from any morbid deposit. These glands were smooth and of a whitish colour externally, with a few small bloody spots. When cut into, their internal structure was likewise seen to be of a light, nearly white, colour with a few small interspersed vessels. They were of a soft consistence, which might be compared to that of a testicle. They possessed a slight translucence, and were nearly or quite uniform throughout, exhibiting no trace of partial softening or suppuration. Although in appearance and consistence these enlarged glands bore considerable resemblance to some fungoid tumours, they presented nothing of the encysted formation. The alteration in this case seemed to consist in an interstitial deposit from a morbid hypertrophy of the glandular structure itself, rather than on a new or adventitious growth. The glands in the groin presented precisely the same character as those just described; the same may also be said of those in the thorax and abdomen, the situation and extent of which will be presently stated.

The pleurae were nearly, if not altogether, free from adhesions and effusion. There were a few ecchymosed spots on the posterior part of the right lung; both lungs were spongy and crepitant, but rather emphysematous, and of a light colour, from the small quantity of blood which they contained.

The bronchial tubes contained some thick mucus.

The pericardium was healthy. The heart was greatly enlarged, and the right cavities particularly dilated; but the left were also large and distended, with thickened parietes. The muscular structure however did not appear to be diseased. The blood in the heart was barely coagulated, resembling that recently drawn into a basin. The glands along the subclavian arteries and about the roots of the bronchi were much enlarged.

In the abdomen nothing particular was noticed about the peritoneum. The glands at the small curvature of the stomach, several in Glisson's capsule, and a large mass of them along the entire course of the abdominal aorta and iliac arteries were greatly enlarged. There was a marked difference in the mesenteric glands, which, though larger than is natural, were none of them of the prodigious size of those above mentioned; they were however of a light colour, and their increase of size evidently depended on an interstitial deposit similar to that of the other glands. One of the enlarged glands in the lumbar region had a good deal of superficial ecchymosis. The absorbent vessels connected with it were enlarged and distended with a bloody serum. A similar fluid less deeply tinged was found in the thoracic duct.

The liver was very large, pale, and slightly granular. The spleen was very greatly enlarged, being at least nine inches long, five broad, and proportionally thick; its colour was lighter and redder than is natural, and more firm and close. On cutting into it an almost infinite number of small white nearly opaque spots were seen pervading its substance; they were of irregular figure, but a few appeared nearly circular. They appeared to depend on a deposit in the cellular structure of the organ. There were no tubercles in the spleen, but the spots just mentioned were perhaps a commencement of this kind of formation.

The pancreas was large and pale, but otherwise healthy. The mucous membrane of the stomach and bowels offered nothing remarkable.

CASE V

Inspection of a middle aged man, who had latterly been a patient of Dr. Back. He had long been in bad health, and had been for some time a patient under Dr. Bright. His last most urgent symptoms were referrible to the chest. When in the hospital the former time, he was observed to have the glands of the neck, and more particularly those near the upper part of the thyroid cartilage, considerably enlarged.

The body was emaciated. The glands before mentioned were still much enlarged, those in the axillae were not observed to be particularly so, those in the groins were somewhat so. The abdomen was distended.

The head was not examined.

The greater part of one lung was distended, solid and void of air, its texture was rather soft and readily lacerable. Its colour seemed to be the result of the acute white hepatization very deeply soiled with reddish brown. The other lung was far from healthy, but it was rather engorged and softened than hepatized, and still contained air. One, if not both, pleurae exhibited traces of recent inflammation with little or no effusion.

Nothing remarkable is remembered to have been noticed in the heart or pericardium.

In the abdomen there was a large quantity of serum with little appearance of coagulable lymph. In the stomach the mucous membrane was not quite healthy, presenting some indications of chronic inflammation; it, as well as the intestines, contained unhealthy secretions. The liver was of remarkably large size, weighing upwards of seven pounds. Its form and the smoothness of its surface were little if at all altered. The colour was somewhat mottled with a mixture of darkish green and yellow. The acini were manifestly enlarged, and it was suspected that they had undergone the fatty degeneration; but on exposure to heat, it appeared to contain little, if any, greasy substance. The spleen was very large, its weight is not known, but it appeared to be four or five times the average size; its texture was rather more solid and compact than is natural; it contained no tubercles, but the cellular structure interspersed through the parenchyma was more conspicuous than is usual, in some parts appearing in the form of specks, in which it was soft and easily broken down. The absorbent glands accompanying

the aorta were greatly enlarged, some equalling at least the size of a pullet's egg; some, but more especially those in the abdomen, were reddened by injected or ecchymosed blood. The receptaculum chyli and some of the larger lymphatic branches, contained blood mixed with dark and almost black coagula. The thoracic duct, which was large, was filled in the same manner.

CASE VI

July 19, 1830. Thomas Black, aged about fifty years, admitted into Barnabas Ward on the 30th of June, 1830, under the care of Dr. Bright. He was affected with large tuberosc swellings of considerable firmness on both sides of the neck, in both axillae, and in both groins. His abdomen was greatly distended, he suffered from difficulty of breathing, and was pale and rather emaciated.

It appeared that, about two years before, he had laboured under fever. That, being exposed to cold, shortly after, he observed the glands swell on one side of the neck; not long after on the other side, and in succession, those in the situations about mentioned.

The body presented considerable lividity, especially the extremities on the left side. The left side of the neck, and the left axilla, presented the largest tumours.

The head was not examined.

The tumours evidently depended on greatly enlarged absorbent glands along the course of the carotid and axillary arteries. On raising the sternum they were found to extend along the subclavians and internal mammaries; they were also found, though in less number and size, along the aorta in the posterior mediastinum; but it did not appear that the bronchial glands were at all similarly affected. There was some appearance of recent pleuritis and serous effusion into the chest.

In the peritoneal cavity there was a large quantity of yellow serum mixed with some flakes of lymph.

A large and continued mass of nodulous glandular tumours surrounded the aorta and iliac arteries, but the mesenteric glands were very slightly affected. The omentum was corrugated. The liver was rather small, with an irregular and uneven surface, its colour was lighter than natural, and the acini were converted into rounded fleshy masses, without any very great change in the intervening cellular membrane. It also contained two or three white tubercles, which resembled fungoid tubercles of the liver, and were situated

at the surface of the organ. The structure dependent on cysts was not demonstrable in them, but from their form it might be suspected. The spleen was of moderate size, and appeared to be quite free from any adventitious deposit, which is a fact worthy of remark, as in very many cases of glandular disease bearing resemblance to the present case, this organ has been affected, and generally tubercular. The pancreas was imbedded in the tumours, but appeared pretty healthy.

The kidneys were livid and congested.

The tumours which formed the most striking features in this case very nearly resembled each other in structure; there appeared to be merely a little difference in firmness; they were of various sizes, from that of a horse-bean to that of a hen's egg; they had a round or ovoid figure, and were invested by a thin membrane, pretty smooth externally, and connected to the loose and apparently healthy cellular membrane which surrounded the tumours; the other surface intimately adhered to the structure of the tumour. This texture was apparently pretty uniform throughout, and was pale and slightly translucent, and could not be said to evince traces of the mode of formation dependent on cysts; they shewed no disposition to suppuration or softening; some, when just taken from the body, were of a semi-cartilaginous hardness, but became considerably softer after a little maceration.

The aorta appeared to be a little compressed by the tumours.

This patient had an old reducible hernia on the right side, on which side there appeared to be hydrocele also.

It may be observed that notwithstanding some differences in structure, to be noticed hereafter, all these cases agree in the remarkable enlargement of the absorbent glands accompanying the larger arteries; namely, the glandulae concatenatae in the neck, the axillary and inguinal glands, and those accompanying the aorta in the thorax and abdomen. That as far as could be ascertained from observation, or from what could be collected from the history of the cases, this enlargement of the glands appeared to be a primitive affection of those bodies, rather than the result of an irritation propagated to them from some ulcerated surface or other inflamed texture through the medium of their inferent vessels, and that although, in some instances, the glands so enlarged may contain a little concrete inorganizable matter, such as is known to result from what is called scrofulous inflammation, it is obvious that this cir-

cumstance is not an essential character, but rather an accidental concomitant to the idiopathic interstitial enlargement of the absorbent glandular structure throughout the body. That unless the word inflammation be allowed to have a more indefinite and loose meaning than is generally assigned to it, this affection of the glands can scarcely be attributed to that cause, since they are unattended with pain, heat, and other ordinary symptoms of inflammation, and are not necessarily accompanied by any alteration in the cellular or other surrounding structures, and do not shew any disposition to go on to the production of pus or any other acknowledged product of inflammation except where, as in the cases above alluded to, inflammation may have supervened as an accidental affection of the hypertrophied structure. Nor can the enlargement in question, with any better reason, be attributed to the formation of any of those adventitious structures, the production of which I have already had occasion to describe, and have referred to the type of compound adventitious serous cysts. Notwithstanding the different characters which this enlargement may present, it appears nearly in all cases to consist of a pretty uniform texture throughout, and this rather to be the consequence of a general increase of every part of the gland, than of a new structure developed within it, and pushing the original structure aside, as when ordinary tuberculous matter is deposited in these bodies. At the same time it must be admitted that the new material by which the enlargement is effected, presents various degrees of organizability, which in some instances is extremely slight, and appears incompetent to maintain the vitality of the affected gland. In such cases the new structure will generally become opaque, soften, or break down, and acting as a foreign irritating body, excite irritation and lead to the formation of abscess. The case of William Burrows, (No. III.), and also that of a native of Owhyhee, who died in Guy's Hospital with extensive abscess in the axilla, are, I believe, to be considered of this kind.

The remarkable appearance of blood in the thoracic duct and some of the absorbents, observed in the case of Thomas Westcott, (No. IV.), although it sufficiently attracted my attention to induce me to have a drawing immediately made, was only regarded as an accidental occurrence; but the recurrence of the same phenomenon to a much more considerable and striking extent in the recent case, (No. V.), induces me to suppose that it is intimately connected with

this glandular disease. It may also be observed that in the last-mentioned case the enlarged glands from which the lymphatic vessels containing blood proceeded, were particularly loaded with blood; and if my recollection does not deceive me, a tendency to the same state was present in the case of Westcott, although it escaped notice in the record of the inspection.

Another circumstance which has arrested my attention, in conjunction with this affection of the absorbent glands, is the state of the spleen which, with one exception in all the cases that I have had the opportunity of examining, has been found more or less diseased, and in some thickly pervaded with defined bodies of various sizes, in structure resembling that of the diseased glands. We might, from this circumstance, be induced to suspect that these bodies in the spleen, like the enlarged glands themselves, are the result of the morbid enlargement of a pre-existing structure, an idea which may derive some support from the fact, that although in human spleens no glandular structure is distinguishable, in those of some inferior animals a multitude of minute bodies exist which appear to be of that nature. Malpighi indeed considered the acini or granulations in the spleen to be glands. In one instance it may be remarked that although the glandular derangement had advanced very far, the depositions in the spleen were extremely minute, assuming the appearance of miliary tubercles. Hence, we may conclude that if, as I conceive to be the case, there be a close connection between the derangement of the glands and that of the spleen, the latter is a posterior effect, and on this account may not always have been produced, when that of the glands or some other disease carried off the patient. In other instances, the spleen, although much enlarged, contained no regular defined bodies, although the white cellular structure was very evident in increased quantity pervading the dense and enlarged mass of the organ. In such cases it might still be doubted whether, had the patient's life been protracted, the deposits in question might not ultimately have taken place, yet I am inclined to believe the contrary, and to suspect that either the previous derangement of the structure of the organ or the greater age of the patients may have opposed their production. I mention this effect of age merely as a suspicion or idea, founded on the fact that I have very rarely, if ever, met with any kind of tubercles, excepting those of malignant character, in the spleens of adults, whilst

they have been by no means unfrequent in a far less number of spleens of children and young persons which it has fallen to my lot to examine. The only exceptions which I can call to mind, as having been furnished by my own observation, have been in the case of one or two foreigners from warm countries, on whom the change of climate may have had considerable effect.

DOMINIC JOHN CORRIGAN

(1802-1880)

ATTENTION HAD several times been called to disease of the aortic valve and its effects on the circulation before DOMINIC JOHN CORRIGAN gave exceptionally clear and detailed consideration to the subject in 1832. His paper "On Permanent Patency of the Mouth of the Aorta, or Inadequacy of the Aortic Valves", appeared in the "Edinburgh Medical and Surgical Journal" in April of that year. The relationship between the symptoms of the patient, the signs elicited on physical examination — to the most outstanding of which the name "Corrigan's pulse" has been given,— and the underlying pathologic change, is so clearly drawn that this article might serve as a model for the exposition of a clinical picture. Selections from this paper and his well-known plate picturing the condition are here reproduced.

ON PERMANENT PATENCY OF THE MOUTH OF THE AORTA, OR INADEQUACY OF THE AORTIC VALVES

The disease to which the above name is given has not, so far as I am aware, been described in any of the works on diseases of the heart. The object of the present paper is to supply that deficiency. The disease is not uncommon. It forms a considerable proportion of cases of deranged action of the heart, and it deserves attention from its peculiar signs, its progress, and its treatment. The pathological essence of the disease consists in inefficiency of the valvular apparatus at the mouth of the aorta, in consequence of which the blood sent into the aorta regurgitates into the ventricle. This regurgitation, and the signs by which it is denoted, are not necessarily connected with one particular change of structure in the valvular apparatus, and hence the name *Permanent Patency of the Mouth of the Aorta, or Inadequacy of the Aortic Valves*, has been chosen as simply expressing such a state of the parts as permits the regurgitation to occur.

I have been in the habit for some years of describing this disease under the name of *Inadequacy of the Aortic Valves*; but as Dr. El-

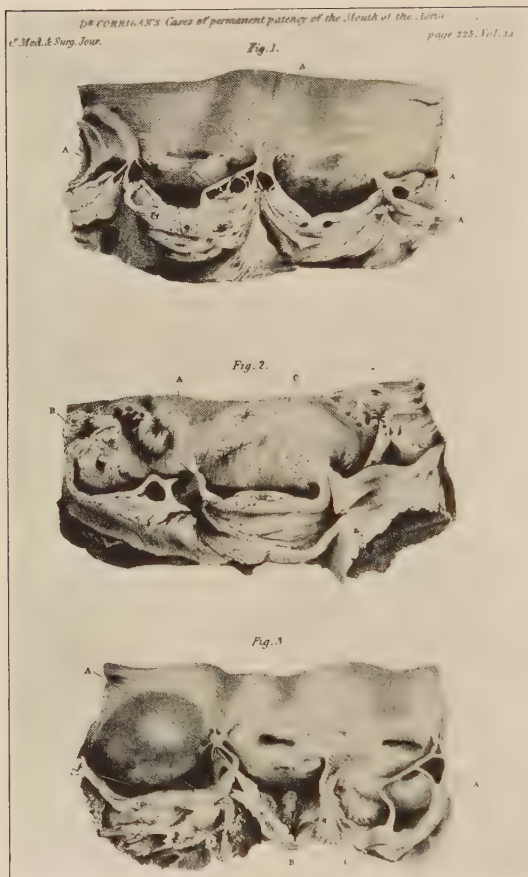


PLATE 18. LESIONS OF THE AORTIC VALVE.
 FROM THE ARTICLE "ON PERMANENT
 PATENCY OF THE MOUTH OF THE
 AORTA" BY DOMINIC JOHN
 CORRIGAN (1832)

liotson, in his elegantly written work on Diseases of the Heart, has given to a somewhat analogous morbid state of the auriculo-ventricular opening, a better name, *Permanent Patency*, I have, for that reason, and for the sake of uniformity, adopted the term, and I shall continue to use it as synonymous with my own term, *Inadequacy* of the Aortic Valves.

The morbid affections of the valves and aorta permitting this regurgitation are the following.

1st. The valves may be absorbed in patches, and thus become reticulated and present holes, through which the blood flows back into the ventricle.—*Vid.* Plate 18. Fig. 1.

2d. One or more of the valves may be ruptured; the ruptured valves, when pressed, flapping back into the ventricle instead of catching and supporting the column of blood in the aorta, the blood then regurgitating through the space left by the broken valves.—*Vid.* Plate 18. Fig. 2.

3d. The valves may be tightened or curled in against the sides of the aorta, so that they cannot spread across its mouth; and an opening is then left between the valves, in the centre of the vessel, through which the blood flows freely back into the ventricle.—*Vid.* Plate 18. Fig. 3.

4th. The valves without any proper organic lesion may be rendered inadequate to their function by dilatation of the mouth of the aorta. The aorta, affected by aneurism, or dilated, as it frequently is in elderly persons, about its arch, will sometimes have the dilatation extending to the mouth of the vessel, and in such a case, the valves become inadequate to their function, not from any disease in themselves, but from the mouth of the aorta dilating to such a diameter, as to render the valves unable to meet in its centre; the blood then, as in the other instances, regurgitates freely into the ventricle.

Fig. 1. This figure scarcely needs any explanation. It shows the reticulated valves.

The letters A, A, A, A, point out the openings produced by absorption in the valves, through which the blood regurgitated. These valves were very slightly thickened.

Fig. 2. A, points out the left-hand valve, with an opening through it large enough to admit a goose quill, and ruptured from its connection with the aorta, so that it flapped back into the ventricle.

B. Bony depositions on the inner coat of the aorta.

C. The middle and right hand valves thickened, and contracted in their free edges, so that they could be separated only a very short distance from the sides of the aorta.

Fig. 3. A, A, Openings in the valves, as in Fig. 1, produced by absorption, one of the openings in the right hand valve large enough to permit the finger to pass through.

B. Middle valve, projecting downwards, curled back, and bound to the aorta by bony deposition, so that it was totally useless.

C. Bony deposition tying the edges of the middle and right hand valve together, and at the same time gluing them to the aorta.

General Symptoms.—On the general symptoms that accompany this disease, little is necessary to be said. Like most of those connected with affections of the respiratory and circulating organs, they are uncertain and unsatisfactory. There are frequently convulsive fits of coughing, more or less dyspnoea, sense of straitness and oppression across the chest, palpitations after exercise, sounds of rushing in the ears, and inability to lie down. Neither one nor all of these symptoms are essential to the disease. They may all arise from varied affections of the lungs, heart, liver, or nervous system. They neither tell us the seat of the disease, nor the extent of the danger.

Signs.—What is deficient in general symptoms from their obscurity, is, however, amply supplied by the certainty of the physical and stethoscopic signs, which may be referred to the three following indications. *1st*, Visible pulsation of the arteries of the head and superior extremities. *2nd*, *Bruit de soufflet* in the ascending aorta, in the carotids, and subclavians. *3d*. *Bruit de soufflet* and *fremissement*, or a peculiar rushing thrill felt by the finger, in the carotids and subclavians. In conjunction with these may be reckoned the pulse, which is invariably full. When a patient affected by the disease is stripped, the arterial trunks of the head, neck, and superior extremities immediately catch the eye by their singular pulsation. At each diastole the subclavian, carotid, temporal, brachial, and in some cases even the palmar arteries, are suddenly thrown from their bed, bounding up under the skin. The pulsations of these arteries may be observed in a healthy person through a considerable portion of their tract, and become still more marked after exercise or exertion; but in the disease now under consideration, the degree to which the vessels are thrown out is excessive. Though a moment before unmarked, they are at each pulsation thrown out

on the surface in the strongest relief. From its singular and striking appearance, the name of *visible pulsation* is given to this beating of the arteries. It is accompanied with *bruit de soufflet* in the ascending aorta, carotids, and subclavians; and in the carotids and subclavians, where they can be examined by the finger, there is felt *fremissement*, or the peculiar rushing thrill, accompanying with *bruit de soufflet* each diastole of these vessels. These three signs are so intimately connected with the pathological causes of the disease, and arise so directly from the mechanical inadequacy of the valves, that they afford unerring indications of the nature of the disease. In order to understand their value, it is necessary to consider their connection with the cause by which they are produced. The visible pulsation of the arteries of the neck, etc. may be first examined.

In the perfect state of the mechanism at the mouth of the aorta, the semilunar valves, immediately after each contraction of the ventricle, are thrown back across the mouth of the aorta by the pressure of the blood beyond them, and when adequate to their function of closing the mouth of this vessel, they retain in the aorta the blood sent in from the ventricle, thus keeping the aorta and larger vessels distended. These vessels consequently preserve nearly the same bulk during their systole and diastole. But when the semilunar valves, from any of the causes enumerated, become incapable of closing the mouth of the aorta, then after each contraction of the ventricle, a portion of the blood just sent into the aorta, greater or less, according to the degree of the inadequacy of the valves, returns back into the ventricle. Hence the ascending aorta and arteries arising from it, pouring back a portion of their contained blood, become, after each contraction of the ventricle, flaccid or lessened in their diameter. While they are in this state, the ventricle again contracts and impels quickly into these vessels a quantity of blood, which suddenly and greatly dilates them. The *diastole* of these vessels is thus marked by so sudden and so great an increase of size as to present the visible pulsation which constitutes one of the signs of the disease.

That this visible pulsation of the arteries is owing to the mechanical cause here assigned is made evident by several circumstances. It is most distinct in the arteries of the head and neck, which empty themselves most easily into the aorta, and of course into the ventricle. In the arteries of the lower extremities, of even larger size than those which present it about the head and neck, it is

not seen to any comparative degree, and most generally not at all while the patient is standing or sitting. It is much more marked in the arteries of the head and neck in the erect than in the horizontal posture; and a patient suffering under the disease himself, first pointed out a circumstance which is convincing of its being produced as asserted. He could increase the pulsation of the brachial and palmar arteries in a most striking degree by merely elevating his arms to a perpendicular position above his head. He thus enabled the brachial and palmar arteries to empty themselves more easily back upon the aorta. They became more flaccid, and then, on the next contraction of the ventricle, their diastole became comparatively greater, and their visible pulsation of course more marked. The same effect could be produced in the arteries of the lower extremities by lying down and elevating the legs on an inclined plane. The strength of the heart has little to do in producing this singular pulsation, for it is never observed in an equal degree, and most generally not at all, in the arteries of the lower extremities.

If it be asked, is the explanation here adduced of the cause of this visible pulsation sufficient to account for its appearance in the brachial and radial arteries, since the blood to return back from these vessels into the arch of the aorta should flow upward when the patient holds his arms in the ordinary position, flexed or hanging by his side? the following reply may be made. When the subclavians are pouring back their blood into the arch of the aorta and ventricle, the elasticity of the brachial arteries, acting upon the blood just urged into them, forces it back along with the retrograde current of the subclavians, no obstacle meeting it in that direction. The brachial arteries thus partially empty themselves, and become in their systole of a lessened diameter like the carotids and subclavians, but in less degree. The next jet of blood from the ventricles dilates them, and as in the subclavians, produces in them a visible pulsation: and if they be assisted in returning their blood by elevating the arms to a perpendicular position, their pulsation becomes, as has been already observed, much more strongly marked. The arteries of the lower extremities are not similarly circumstanced. The arteries of the upper extremities are assisted in emptying themselves back towards the heart, by the retrograde current in the subclavians and ascending aorta; but on the blood contained in the arteries of the lower extremities, the tall column of blood in the descending aorta is pressing, and prevents any return; or if it be supposed that of the

large mass of blood in the descending aorta, a small portion flows back into the arch, it can produce little change in the contents of the iliacs and femorals; and moreover, whether the column of blood in the aorta be lessened or not in diameter, the pressure on the contained blood of the iliacs and femorals will remain the same, and keep these vessels distended. If we, however, as already observed, alter the relation of the several arteries to the arch of the aorta, so as to facilitate the reflux of their contained blood, for instance from the radial arteries, by raising the arms to a perpendicular line above the head, from the iliacs and femorals, by placing the patient in a recumbent posture, and raising the legs upwards on an inclined plane, the visible pulsation becomes much more marked in these respective arteries.

The *bruit de soufflet*, which is heard in the ascending aorta, carotids, and subclavians, with the accompanying *fremissement* in the latter arteries, is next to be considered. The *bruit de soufflet* characterizing this disease, is heard, as already observed, in the ascending aorta, its arch, and in the carotids and subclavians. It can be followed upwards from the fourth rib along the course of the aorta, increasing in loudness as it ascends, until it is heard of great intensity at the upper part of the sternum, where the arch of the aorta most nearly approaches this bone, and then branching to the right and left, it can be traced into the carotids and subclavians of both sides; and in these trunks it assumes a harshness that it did not possess in the aorta. This *bruit de soufflet* is synchronous with the visible pulsation, with the diastole of the arteries. It is of no consequence whether the ascending aorta and its large branches be sound or be diseased; the *bruit de soufflet* is as loud in the one case as in the other. To account for the presence of this sign, and why it extends so far from the seat of the disease and along sound vessels, it is necessary to refer to a paper published in the *Lancet* of 1829, Vol. ii. p. 1. Continued observations from the date of that paper to the present, have confirmed the view then taken of the cause of that singular sound; of its being dependent purely on a physical cause, on a mechanical change in the manner of the blood's flowing.

In that paper is related an experiment, which it may be well to recapitulate here. A flexible tube, such as a piece of small intestine, or a portion of artery, is connected by one end with a tube which has a current of water of considerable force running through it. While the piece of intestine or artery is kept fully distended by the supply of water from the tube, no sound is produced by the motion

of the fluid; but if the flexible tube, while the fluid is moving through it, be pressed upon in any part, so that the quantity of fluid passing through the contracted part is no longer sufficient to keep the further portion of the tube tense, then, beyond the contracted part, where the tube is less tense, or in some degree flaccid, a distinct, and, according to the velocity or force of the current, a loud *bruit de soufflet* is heard; and, at the same time, if the finger be gently laid upon the part of the tube where the *bruit de soufflet* is heard, a slight trembling of the tube is perceived, evidently arising from the vibrations into which the current within is throwing its sides. If, in place of constricting any one part of the flexible tube, the whole tract of tube be allowed to become partially flaccid, by diminishing the supply of fluid, and the fluid be then allowed to rush along the tube by jets, at each jet the tube is suddenly distended, resembling the visible pulsation described above; and with each diastole of the tube, there is a sudden and loud *bruit de soufflet*; and, synchronous with the *bruit de soufflet*, there is *fremissement* felt by the finger.

Both the sound heard and the sensation felt by the finger in this experiment may be explained by the principles which regulate the motion of fluids. It may be remarked, that it is a property of fluid in motion, that, when discharging itself from the orifice of a tube into open space, or into a vessel of wider capacity not fully distended, its particles move in lines from the orifice, like so many *radii* tending to leave vacuums between them. When the flexible tube, artery, or intestine, therefore, is kept fully distended, the fluid moves forward as a mass, there is no tendency in its particles to separate from one another,—they all press equally,—there is no vibratory motion of the sides of the tube, and consequently no sound, and no *fremissement* or trembling. But if the tube be not kept fully distended, then the fluid propelled through it rushes along as a current; and its particles tending to leave vacuums between them, throw the sides of the tube into vibrations, which can be very distinctly felt by the finger, and which give to the ear the peculiar sound *bruit de soufflet*, and to the touch *fremissement*.

These principles may be applied to the state of the ascending aorta and its branches in the instances before us. When the aortic valves are fully adequate to their function of perfectly closing the mouth of the aorta, and thus preventing any regurgitation of the blood, the aorta and its branches are kept fully distended, the blood is at each contraction of the ventricle propelled forward *en masse*,

and there is no trembling, or vibratory motion of the sides of the aorta, carotids, and subclavians, and, as in the flexible tube when fully distended, no sound is emitted. But when the valves, becoming inadequate to their office, permit some of the blood contained in the ascending aorta, carotids, and subclavians, to return into the left ventricle after each contraction, then the aorta and these trunks become, like the flexible tube in the second part of the experiment, partially flaccid; and at the next contraction of the ventricle, the blood propelled into them is sent along as a rushing current, which throws the sides of these arteries into vibrations, and these vibrations give to the ear *bruit de soufflet*, and to the finger *fremissement*. These two signs may be traced to a varying distance from the mouth of the aorta, and always along the carotids, and to the outer third of the subclavians, and sometimes in the brachial arteries, as far as the bend of the arms, the distance to which they are heard being determined by the limit to which the current-like motion of the blood producing them is extended. In those cases in which the deficiency of the valves is considerable, allowing a full stream of blood to rush back into the ventricle, there is heard in the ascending aorta a double *bruit*; the first accompanying the *diastole* of the artery, the second immediately succeeding; and, in listening to the two sounds constituting this double *bruit de soufflet*, the impression made distinctly on the ear is, that the first sound is from a rushing of blood up the aorta, the second from a rushing of it back into the ventricle. It is impossible for those who have not heard this double *bruit* to conceive the distinctness with which the impression described is made on the ear. A patient in one instance heard this double sound distinctly in his own person, and referred it to its cause, a rushing of blood *from* and *to* the heart. The *bruit de soufflet* and *fremissement* are not perceived in the arteries of the lower extremities, when the patient is in a sitting or standing posture. The pressure of the blood in the abdominal aorta is sufficient in these postures to keep the vessels arising from it fully distended; and thus no vibratory motion of their parieties being permitted, there is no bellows sound, nor *fremissement* or rushing thrill.

* * *

The disease we are considering is an inadequacy in the valvular apparatus at the mouth of the aorta permitting a regurgitation of blood into the ventricle. In the perfect state of the valvular appa-

tus at the mouth of the aorta, the valves support by intervals the column of blood in the aorta, and the heart with its ordinary complement of fibre and of muscular strength, is with this assistance competent to the office it has to perform. But when, in consequence of a deficiency in the valvular apparatus, the heart does not receive its due share of assistance from these valves, and is obliged to perform not only its own function of propelling the blood, but has in addition to support after each contraction a portion of that weight of blood which should then be wholly supported by the valves, it is no longer in its ordinary state equal to the task imposed upon it. In such circumstances, nature, to enable the heart to perform the additional labour thrown on it, increases its strength by an addition of muscular fibre, and the heart thus becomes hypertrophied, in accordance with the general law, that muscular fibres become thickened and strengthened when there is additional power required from it. Is this hypertrophy disease, or is it a wise provision of nature, by which the organ is thus made equal to the increased labour it has to perform? On the answer depends the treatment to be adopted; and on this there is no room for hesitation. A heart of ordinary strength could not, under the circumstances, carry on the circulation; and nature then wisely endows the heart with the requisite degree of strength. It is at once obvious that to interfere with this wise provision of nature, to diminish the strength of the heart, or, if we choose other words, to direct, according to the advice of Laennec, Bertin, etc. our measures against the hypertrophy of the organ, is to deprive the system of the only power which enables the heart to carry on the circulation. No one thinks of directing measures to diminish hypertrophy of the muscular tissue of the stomach, in narrowing of the pylorus from scirrhus, of the bladder or rectum in stricture of the urethra or intestines.

In these instances the hypertrophy is recognized as a provision of nature to make the power of the part equal to the obstacle it has to overcome; and yet this simple principle seems to have been entirely overlooked in diseases of the heart, as if this organ possessed muscular fibres of a different nature from other organs, or as if, in adapting itself to obstacles affecting its action, it follows laws different from other muscular parts. The consequence of the neglect of this principle has been, that too often, in treatment of a valvular alteration in the heart, there has been a constant struggle between

nature and medicine. Nature has been making the organ equal to its task; while medicine has been directed to counteract nature's efforts, and, by weakening the organ, to render it totally incapable of its task. The repeated bleedings, the starvings, the enforcement of debilitating measures, are totally unsuited to the disease we are considering.

JEAN CRUVEILHIER

(1791-1873)

THE FIRST independent chair of pathological anatomy in Paris was filled by JEAN CRUVEILHIER, a pupil of the surgeon Guillaume Dupuytren, who endowed the position with a legacy from his practice. Cruveilhier's training took place in the great period of pathological anatomy in France, which followed in the wake of war and poverty, when the hospitals were crowded, sanitation at its worst and the mortality from disease tremendous. Impressed from the days of his internship on, by the untoward course of putrid wounds, Cruveilhier devoted a large share of his attention to the subject of inflammation. So struck was he by the frequently associated clotting in the veins that he made this phenomenon, thrombophlebitis, the central point in his widely received but erroneous teaching on the subject of inflammatory change in general. As a teacher and writer he is notable for two great texts of pathology, the one of which was a beautifully lithographed two volume atlas of morbid anatomy with descriptions and case reports ("*Anatomie Pathologique du Corps Humain*," 1829-1842), and the other a five volume "*Treatise on General Pathological Anatomy*," (1849-64). His matured views on phlebitis were published, like several other important French monographs of the period, in the "*Dictionnaire de Medicine et de Chirurgie Pratiques*" (1837). The opening paragraphs from this are reproduced below, with two selections from the "*Anatomie Pathologique du Corps Humain*" which in their objective analysis have much to commend them still, but show how woefully misunderstood the phenomena of sepsis and pyemia were in Cruveilhier's time.¹

PHLEBITIS

(From the *Dictionnaire de Medicine et de Chirurgie pratiques*, 1837)

Phlebitis is the happy name given to inflammation of the veins by M. Breschet, who has gathered together the scattered facts known about the local effects of this inflammation in certain scientific notes (translation of Hodgson). Misinterpreted for a long time, phlebitis was first studied by Hunter (*Trans. of a Soc. for the*

¹ Translations by William H. Wilder, Jr.

improvement, etc. 1793), who, in some ingenious experiments, considered not only the local effects of inflammation of the internal membrane of the veins, but also its general effects; and tried to determine the way in which it influences the constitution.

In a way phlebitis dominates all pathology. It is the tie which unites the blind and almost instinctive humoralism of the ancients with the rational humoralism of the moderns. Phlebitis has brought back to life, by giving meaning to them, such expressions as *alteration of the blood and infection of the blood*, both of which the school of Pinel had stigmatized with the marks of ridicule. It has also furnished the solution of a multitude of phenomena that defied all explanation and theory, because it gives opportunity for positive experiments.

Phlebitis belongs to both surgery and medicine. We find a *traumatic phlebitis* and a *non-traumatic* or *spontaneous phlebitis*. The death of the largest number of those who succumb to wounds and surgical operations is the result of phlebitis. According to a series of facts and experiments, the results of which I have published (*Nouv. Bib. med.* 1826 1, *Recherches sur le siège immédiat de l'inflammation*), the capillary venous system is the source of all inflammation, as well as of all normal or morbid secretions.

On the basis of its source three kinds of phlebitis may be distinguished: (1) phlebitis of the free veins; (2) phlebitis of the veins contained in the depths of the organs; (3) capillary phlebitis. In this article I shall examine: (1) the local phenomena of phlebitis; (2) the influence it has on the constitution, or consecutive phenomena. I shall say a few words on phlebitis as considered in the different parts of the body it attacks, and more especially on uterine phlebitis, phlebitis of the dural sinus, pulmonary phlebitis, that of the upper and lower members, and phlebitis following other diseases; and I shall terminate with a few remarks on phlebitis considered in its relations with diverse organic lesions.

ARTICLE I. LOCAL PHENOMENA OF PHLEBITIS

The first effect of all phlebitis is the coagulation of the blood and its adherence to the walls of the vessel. This coagulation with adherence may be observed in traumatic as well as spontaneous phlebitis. I have frequently produced it in my experiments on living animals, either by introducing a wooden splint into the veins, or by the injection of some chemically irritating substance.

Stagnation of the venous blood and serosity in the corresponding parts result from obstruction of the venous circulation in the inflamed vessel, provided the collateral veins are not sufficient for circulation. Painful edema, *phlegmasia alba dolens* in women at child birth, may be considered a characteristic sign of phlebitis, just as after phlebotomy or in any other circumstance. This edema is usually proportional to the trouble in the venous circulation, whose consequence it is.

Independently of edema external phlebitis is also characterized by the presence of a hard, painful and easily defined cord, which exactly follows the course of the vein.

Lymphatitis (inflammation of the lymphatic vessels) may easily be distinguished from phlebitis by the slenderness of the painful cord, by its more superficial position than in phlebitis, by the large number of little knots that interrupt it from place to place, and by the pink colour of the skin along the course of this cord. It is evident that these characteristics apply only to an inflammation of the superficial vessels; as for a differential diagnosis of a deep-lying lymphatitis and phlebitis, that seems to me impossible to establish in the present state of science.

INFLAMMATION OF THE PULMONARY ARTERY AND LOBULAR PNEUMONIA FOLLOWED BY PHLEBITIS

(From the *Anatomie Pathologique du Corps Humain*, 1829-35)

From the general considerations on which I wrote above it follows: first, that lobular pneumonia is the most frequent change following wounds and surgical operations; second, this lobular pneumonia is nothing but a capillary phlebitis; third, this capillary phlebitis always coincides with some phlebitis more or less distant giving rise to pus, the material cause of the visceral inflammation; fourth, in the cases where this phlebitis, which one might call primitive, does not seem to be present, one should break the bones that have been fractured or amputated, and he will then find that their spongy tissue is more or less infiltrated with pus; fifth, the practitioner must concentrate all his efforts on this primitive phlebitis; prevent it, if possible, limit it, if it has already declared itself, and prevent by all possible means its terminating in suppuration; this is the only rational method of treatment. For, if the blood is once infected by the mixture of pus, and this infection renews itself, so to

speak, at every instant, I know of no therapeutic methods to take away the pus; fever alone can eliminate through the excretory channels the harmful matter introduced into the flood of the circulation. It is probable that sudorifics, purges, and all kinds of cutaneous derivatives would obtain good results, if the suppurating phlebitis were not of an ever recurring type.

But, in the same way as one observes capillary phlebitis and phlebitis of the large vessels in all parts of the body, so the lungs display, in addition to the lobular inflammations (capillary phlebitis), inflammations of the principal divisions and even of the trunk of the pulmonary artery. This, as is well known, carries venous blood and in consequence represents the veins of the other parts of the body from this point of view.

Marie Antoinette D., 29 years old, of an extremely nervous temperament, a primipara, entered the Maternité July 12, 1830. She had been delivered the night before; the labor was rapid, but delivery was artificial, taking place only fifteen hours after lying-in, and followed by a considerable hemorrhage.

The face was pale, the pulse slight and frequent. The patient suffered marked weakness. There was a sharp hypogastric pain in the uterine region, increased by the slightest pressure.

I diagnosed an incipient uterine phlebitis, for a pain confined to the uterus and taking place after a tardy artificial delivery, or even after a hemorrhage following the delivery, always seemed to me to indicate an inflammation of the veins or of the lymphatic vessels of these organs. The extreme weakness of the patient, who was almost anemic, and her excessive nervous mobility, imposed the greatest caution on the use of antiphlogistics (twenty leeches on the hypogastrium; cataplasms and emollient douches; emollient uterine injections; barley, edulcorated couch-grass, nitrated, 3 pints; strict diet).

On the 31st the hypogastric pain had diminished; the febrile movement persisted but less intensely. The emollient treatment was continued.

On the 14th the milk rose (the patient nursed her child).

On the 15th, 16th, and 17th there was abundant sweating, thirst, varying nervous activity, headache and tendency to syncope; the hypogastrium was very slightly sensitive to pressure. A few spoon-

fuls of potion containing a grain of gum extract of opium brought on a great calm.

On the 18th, 19th, and 20th she felt better, but the pulse was always high. On the 21st there was a return of hypogastric pains throughout the entire abdomen (40 leeches, two four-grain tablets of calomel with two grains of digitalis). Several diarrhoeatic stools. Some relief.

On the 23rd violent pains at the level of the left false ribs. The patient assured us that she was used to these pains, which always disappeared on the application of a vesicatory. The exploration of the thorax having given no result, I concluded that we had to do with a pleurodynia; this resisted massage and plasters, but was dispelled by a vesicatory applied on the 24th.

From the 25th of July to the 3rd of August the patient seemed to be getting better. She nursed her child with more success than before; moreover, the secretion of milk had only been diminished, never stopped.

On the 3rd of August, new symptoms. Oppression, cough, difficulty in expectorating, anxiety, nervous state, extremely rapid pulse. The hypogastrium gave no sign of sensibility. Exploration of the thorax gave no appreciable result. Percussion gave a natural sound; on auscultation only a light rumbling was heard in the lower part of the back. The secretion of milk had stopped. (Vesicatory on the side, infusion to the chest.)

The 4th and 5th, same condition. Strained face, oppression, cough, anxiety, weak pulse, very frequent, diarrhoea provoked by two ounces of "marmalade de Tronchin." The following days the patient complained of nothing; diarrhoea, respiration more and more frequent, no expectoration. Two vesicatories administered to the internal part of the thighs. Died the 9th, twenty-eight days after lying-in.

Autopsy: No traces of peritonitis in the abdomen. With the exception of a trace of arborization in the large intestine the stomach and both large and small intestines are normal.

The uterus, having returned to normal, is only a trifle larger than its natural volume. The uterine, ovarian and nearly all the hypogastric veins are like hard cords. This hardness they owe to compact, adhering, discolored clots which fill them. The external iliac vein, the left crural vein, and some of their divisions, contain clots less compact and adherent, evidently of a recent date.



PLATE 19. SEPTIC INFARCTS OF THE LUNG. FROM
THE "PATHOLOGICAL ANATOMY OF THE HUMAN
BODY" BY JEAN CRUVEILHIER (1829-35).

Lungs: [See Plate 19] At the base of the left lung can be seen two small superficial purulent spots visible through the pleura because of a yellowish white color. In the interior of one of them is a small adherent escarre. Several other points on the surface of the lung show compactness and a red color of varying shade. One of them resembles a small apoplectic spot.

The posterior half of the inferior lobe of each lung is completely unsuited for respiration, since it is full of a puriform serosity.

Making incisions here and there in this lung I came upon hard concretions filling the divisions of the pulmonary artery. This artery, dissected with care, showed a discolored sanguinous concretion, lightly adherent to the walls. This concretion divided in the manner of the artery, and penetrated to a certain number of fairly slender ramifications. It was easy to see that the coagulation of the blood had started with the arterial trunk and extended from there to the last divisions. The clots in these small divisions were red and of no great consistence, whereas those in the main trunk presented unequivocal traces of their age because of their coherence and discoloration. I divided these clots and found in the center of the main clot a collection of pus, that had all the characteristics of phlegmonous pus. Farther on the blood clot was discolored, but solid.

Comment:

I. Thus this patient succumbed to a pulmonary phlebitis after having resisted a uterine and hypogastric phlebitis. The clinical history of the illness accords perfectly with the results of the pathological anatomy. The uterine and hypogastric phlebitis dominated all symptoms from the 12th to the 25th of July, for I do not believe that the pleurodynia, familiar to the patient, observed on the 23rd, can be regarded as the prelude of a pulmonary affection. From the 25th of July to the 3rd of August the patient seemed to be recovering, when the dyspnea, the cough, and other circumstances that evidently indicated a lesion of the principal organ of respiration, appeared. I must even add that I suspected a capillary phlebitis of the lung, i.e. a lobular inflammation, the diagnosis of which cannot be accomplished by auscultation and percussion.

II. The connection between uterine and hypogastric phlebitis on the one hand, and pulmonary on the other, is easily conceived. It is enough that a small amount of the pus formed in the uterine and pelvic vessels be mixed with the blood to explain the inflammatory spots at the base of the lung and the inflammation of the pulmonary

artery and its divisions. After consideration of analogous cases I am inclined to regard the hard and discolored concretions that filled the uterine and hypogastric veins as the beginnings of healing. They would soon have been diminished molecule by molecule by absorption and would have completely freed the veins, which would either have become obliterated or remained permeable to the blood.

III. Therefore a uterine phlebitis is cured just as is an external one. The important point is to restrict the inflammation and prevent the formation of pus. One can recover from lobular pneumonia when the seats of inflammation are few in number. I am convinced that my patient would have recovered if to the capillary phlebitis of the lung there had not been added the inflammation of the pulmonary artery. The acute edema shown by the posterior half of the two lungs, which was absolutely unsuited for respiration, seems to me to have strongly contributed to the fatal issue of the disease.

This is not the first time that I have observed concretions in the ramifications of the pulmonary artery. I have seen them in a number of cases of diffused pneumonia that had attacked half or two thirds of the lung. More frequently these inflammations of the artery coincide with lobular inflammation.

The following fact has much in common with that given above. I regret that I was unable to find notes on the history of the illness.

I found in a woman who died 15 days after confinement and showed the ensemble of so-called typhoid symptoms the last days of her life, that the main iliac vein and its divisions were full of sanguinous adherent concretions, showing different degrees of age. White in the main trunks, the concretions contained pus in the center; they were red and gradually less and less coherent in the last divisions. Moreover, the inferior extremities did not show the slightest edema.

The liver was a nankeen color and flabby. The uterus was equally flabby, but without other alteration.

There were present at the same time pleurisy of the posterior edge of the right lung, ordinary or diffuse pneumonia, and lobular pneumonia. The pleurisy was evidently secondary. The tissue of the divided lung showed vessels full of fibrinous concretions: these vessels were divisions of the right pulmonary artery. The concretions that were white and full of pus at their center divided and sub-divided like these arteries until they at last became red and

hardly coherent. But these concretions of the small vessels only existed in the neighborhood of the parts of the lung affected with lobular pneumonia.

In the portion of the lung affected by ordinary inflammation (diffuse pneumonia) the tissue of the organ was infiltrated with pus, and in the state known as grey induration.

Circumscribed spots of inflammation (lobular pneumonia) showed great differences in the matter of volume and degree of inflammation: on the one hand, red indurations; on the other, spots mottled white and red; a little farther on, infiltrated and combined pus; in still another place the pus beginning to unite in irregular spots.

I saw an extremely rare pathological condition in this case. A rather large and irregular shred of lung was isolated in the middle of the organ and held only by a very slender pedicle formed of blood and air vessels. This piece presented no symptoms of gangrene.

GENERAL CONSIDERATIONS ON THE DISEASES OF WOMEN IN THEIR CONFINEMENT, AND ON PUERPERAL TYPHUS

(From the *Anatomie Pathologique du Corps Humain*, 1829-35)

I. The woman who has just been delivered has escaped only a part of the dangers that threaten her in the accomplishment of this painful function. Few women die in the act of giving birth itself; a considerable number die because of its consequences. The frequency and gravity of puerperal ills can be conceived if one considers: first, the organic and vital changes involved by the state of being with child in the economy of woman; second, those brought about by the act of giving birth; third, those following this act.

I have elsewhere called attention to (1) the hypertrophy of the tissue of the uterus following impregnation—a physiological hypertrophy, it is true, but one that embraces the morbid state; (2) the increase in size of the large ligaments covering the uterus when it is with child; and (3) traction which the uterus exerts on the peritoneum covering the neighboring organs. The marked development of the arteries and the even more considerable development of the veins and lymphatic vessels, have held my attention equally.

II. I have compared the woman who has just given birth to one who has just received a severe wound or undergone a surgical operation. The woman in child birth, quite like a patient who has

lost a limb, is exhausted by fatigue, pain, and emotions of every sort. The quiet, or rather the exhaustion that follows the laborious operation of giving birth, is the faithful image of the exhaustion that follows a serious wound. We may compare the interior surface of the uterus to a vast solution of continuity; for the ovum does not adhere to the uterus by its placental parts only, but by its entire surface. The internal mucous membrane no longer exists, or rather its elements have dissociated, modified by the adhesive inflammation of which it has been the seat. If one examines the inner surface of the uterus immediately after delivery (and I have had the opportunity of doing this several times), one sees on the uterine cotyledons gaping venous orifices representing those of the severed vessels. One finds remains of the mucous membrane only on the internal side of the uterine cervix and sometimes at the orifices of the tubes. Everywhere else the tissue of the uterus itself is exposed, and it must everywhere be covered by a scar.

III. In order to repair such a large solution of continuity a traumatic fever is necessary. This fever is called "milk fever" because, as a result of laws easy to understand by their results, but impossible to determine by their means, this fever is accompanied by the secretion of milk in the breasts. This traumatic fever of a woman who has just given birth has its period of incubation like the traumatic fever of the wounded. This period is three, four, or five days, and shows the same characteristics in both. The fever dies down at the end of twenty-four hours and is almost gone the third or fourth day.

IV. Moreover a cure without fever, without purulent lochia in a woman in child birth, corresponds to the union by first intention in the wounded. This way of healing is very rare, for it is necessary that the mucous membrane be regenerated and that the equilibrium of circulation and of vitality reestablish itself.

V. The first phenomenon shown by the internal surface of the uterus is the secretion of a false membrane or buffy coat that covers all this internal surface. It is with the help of this false membrane that the immediate cicatrization of the uterus takes place, and it is known to be also with the help of a false membrane that union by first intention of wounds takes place.

VI. Usually, however, this false membrane is carried off by the pus secreted after the traumatic fever. The pus from the internal surface of the uterus is called lochia. This is at first bloody or mixed

with blood, and has a very fetid odor, just like the sanious pus of wounds, but it soon becomes purulent, less fetid, and less and less abundant, until it finally stops completely. The lochia, like the pus of wounds, are in quantity and quality the thermometer of the general condition.

VII. If the internal surface of the uterus is examined during the process of suppuration, the uterine cotyledons are found to be full of bloody concretions that fill their mesh, and the internal surface of the uterus is covered with a pseudo-membranous, purulent, bloody layer, often roughened by very long vascular filaments, much like a thick green sward. These become very conspicuous when the uterus is put in a jar of water.

VIII. The uterus gradually returns to normal. Its internal membrane is reconstructed by the knitting together of the vascular filaments. The uterine cotyledons are no longer anything but very small vegetations or caruncles. After six weeks, two months, or two months and a half, traces of the cotyledons can still be seen. This fact could be of great importance in legal medicine. Moreover, for a long time, the uterus remains more voluminous than before the birth and the deeper layers of this organ are remarkably fragile.

IX. So much for the regular state, but how many accidents cross this work of separation and restoration! The frequency and gravity of these accidents can be conceived if one considers the fact that this work does not consist simply in the cicatrization of the internal surface of the uterus, but that the hypertrophied uterus, which during gestation was such a considerable center of fluxion, must become what it was in the first place, and that its large arteries and its huge lymphatic and venous vessels must be reduced suddenly to perhaps a twentieth of the size they were during the terminal period of the pregnancy. And indeed hemorrhage, convulsions, coma, peritonitis, inflammation of the sub-peritoneal cellular tissue, inflammation of the lymphatic vessels, phlebitis and all the accidents that accompany wounds and major surgical operations, pleurisy, inflammation of the synovial membranes and the muscles, enteritis, painful edema, erysipelas, in brief a multitude of occasional and chronic affections with individual characteristics, all complicate the period after child-birth.

Of all the diseases that can attack a woman in lying-in there is none more frequent, serious, or quickly mortal than so-called "puerperal peritonitis." Deadly even in a sporadic state, it acquires

such gravity in the epidemic condition, that it seems to attack life at its source and resists all methods of treatment, either empirical or rational, known to this date. It is to this epidemic peritonitis, occurring every year at the Maternity Hospital, that I have given the name of "puerperal typhus," in order to draw every attention to its eminently miasmatic character. Désormeaux and others have already exhumed the old name "puerperal fever," wishing by this apparent linguistic anachronism, to express these important facts: first, that peritonitis is not the only lesion with which this disease is accompanied; second, that the therapeutic methods directed against phlegmasias are not all included in this class of diseases.

XI. Puerperal typhus is a disease produced by congestion, an infectious disease, a contagious miasmatic disease that will ravage the Maternité, as well as all lying-in hospitals, as long as the population of these hospitals is not in harmony with their capacity, as long as three thousand women with child are taken in every year in a place that can care for from fifteen hundred to two thousand only. For a woman in child-birth is much more liable to infection than other sick persons. As a result this question of crowding is a question of life and death for a woman with child. Preventive treatment is the only one that can be used, for in a huge majority of cases there is no curative treatment, and it is the exception if one is able to save a few patients affected with real puerperal typhus. If the patient should escape peritonitis, she will not escape an inflammation of the sub-peritoneal cellular tissue, a double pleurisy, or the spreading erysipelas that successively attacks all parts of the body and that sometimes again invades the regions first affected. And lastly she will not escape inflammation of the muscles and synovial membranes. It seems as if a leaven that is constantly being restored were circulating with the blood, and it may be that in many cases one of the sources of this leaven is the inflammation of the lymphatic vessels of the uterus, or rather the presence of pus in this type of vessel.

Since it seemed to me that the presence of pus in the lymphatic vessels is a fundamental matter in the history of puerperal typhus and sporadic puerperal peritonitis, I have believed it useful to publish some illustrations of this subject, wherein the well-known talent of M. Chazal shines with all its brilliancy. [Plate 20.]

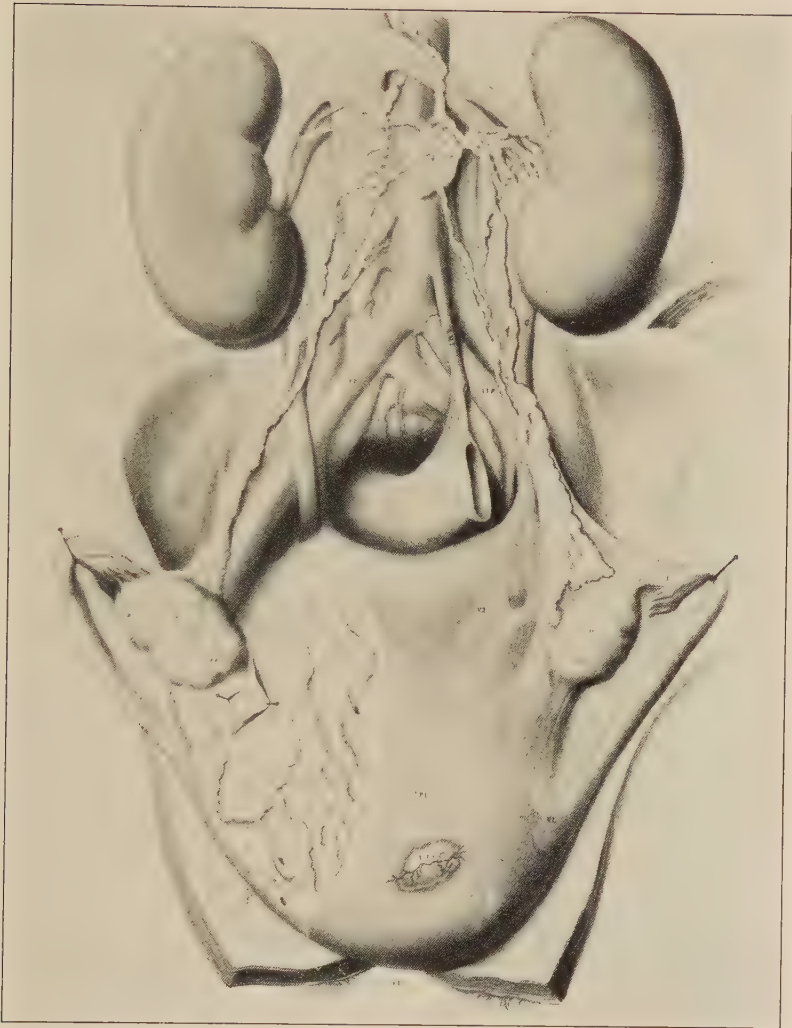


PLATE 20. LYMPHANGITIS. FROM THE "PATHOLOGICAL ANATOMY
OF THE HUMAN BODY" BY JEAN CRUVEILHIER (1829-35)

WILLIAM WOOD GERHARD

(1809-1872)

*A*N ACHIEVEMENT of the first importance, and one of the most fruitful contributions from the United States to the general subject of pathology, was the distinction brought to light by WILLIAM WOOD GERHARD of Philadelphia in 1836 between typhoid and typhus fevers, as they are now known. Gerhard's epoch-marking article was published in the "*American Journal of the Medical Sciences*" in February 1837, and served to complete the masterly investigations of Pierre-Charles-Alexandre Louis of Paris, under whom Gerhard had studied shortly before. The possession of a symptom in common, stupor (τῦφος, typhus), prevented the early separation of two diseases, the anatomic lesions of which are quite dissimilar. As Gerhard pointed out, both were known in Paris, although considered simply manifestations of one disease. One form was especially prevalent in Paris and the other in Ireland and England. Gerhard took advantage of an outbreak of what proved to be typhus fever, shortly after his return from Paris to Philadelphia, to make a very thorough investigation, which in result showed quite clearly that there was no relation between this disease, commonly known as "spotted" fever, and the dothienenteritis endemic in Paris, which was regularly characterized anatomically by involvement of the Peyer's patches of the intestine. Selections from his lengthy article summarizing his discoveries in the pathological anatomy of typhus, and presenting his reasoning for its separation from the malady with which it was confused, are given below.

ART. I. ON THE TYPHUS FEVER, WHICH OCCURRED AT PHILADELPHIA IN THE SPRING AND SUMMER OF 1836; ILLUSTRATED BY CLINICAL OBSERVATIONS AT THE PHILADELPHIA HOSPITAL; SHOWING THE DISTINCTION BETWEEN THIS FORM OF DISEASE AND DOTHIENENTERITIS OR THE TYPHOID FEVER WITH ALTERATION OF THE FOLLICLES OF THE SMALL INTESTINE.

During a residence of two or three years at Paris, I had studied with great care the pathology and treatment of the disease usually termed, in the French hospitals, typhoid fever or typhoid affection. There is another designation for it, founded on its anatomical

characters, and therefore more directly in accordance with modern medical nomenclature; it is dothienenteritis. This variety of fever, which is identical with the disease termed typhus mitior or nervous fever, is frequent at Paris, and is almost the only fever which can be said to be endemic there. Intermittent and remittent fevers are rarely seen, except amongst those individuals who had already contracted some form of these diseases in the malarious districts of France. Some slight fevers, attended with a whitish or yellow tongue and gastric symptoms, occasionally occur; they scarcely assume the form of a fixed disease, and usually disappear under a very simple treatment.

These fevers were the only ones known at Paris for some years past; but in 1813-14, there occurred a severe epidemic fever, characterized by extreme prostration and strongly marked cerebral symptoms. This epidemic was first noticed amongst the troops who returned from Napoleon's unsuccessful campaigns in Germany and the east of France; it afterwards spread amongst the inhabitants of Paris and other large cities, and was everywhere extremely fatal. No accurate description of this fever is on record, although it was witnessed by several of the most distinguished French physicians. Some of these, more especially Louis and Chomel, are inclined to consider it as identical with the prevailing dothienenteritis, but their opinion is probably erroneous, and the disease, as far as we know, should be classed amongst the forms of continued fever, distinguished by the terms typhus, typhus gravior, petechial or spotted fever, etc.

There are, however, complete histories of the typhoid fever or typhoid affection, or dothienenteritis, (all names belonging to one disease). It is one of the most frequent and the most severe acute affections observed at Paris, and has been studied with extreme accuracy, more especially by Louis and Chomel, who have both published admirable descriptions of it. The work of Dr. Louis is especially interesting, and is a model in its kind; he has analyzed the symptoms and pathological phenomena of the fever so accurately and fully, as to surpass any other description of individual diseases. The typhoid fever was placed by this work of Dr. Louis, in the same relation to other fevers that pneumonia holds in reference to the affections of the chest. They are both so well studied, and their symptoms are so well known, that they serve as types with which other less thoroughly understood affections may be compared.

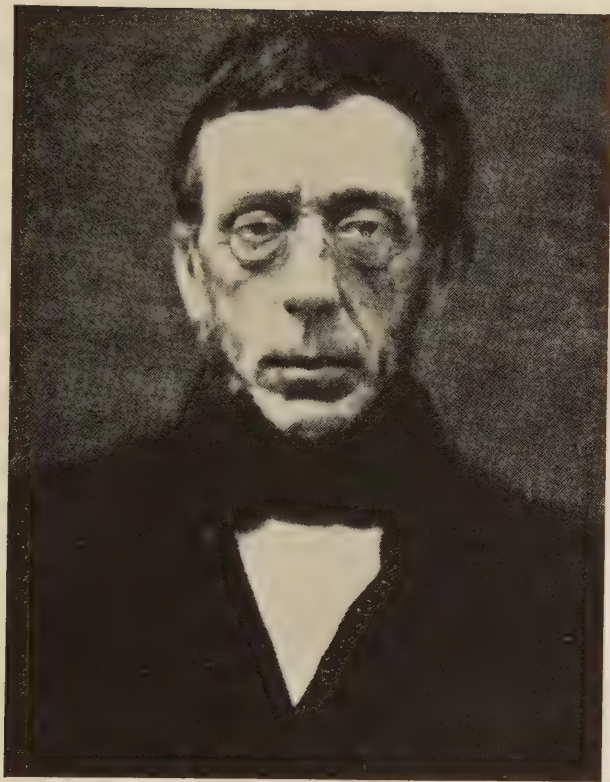


PLATE 21. WILLIAM WOOD GERHARD (1809-72)

It affords us, then, great advantages in the investigation of the history of fevers, to begin with the typhoid, as the best known of these affections. Assuming this disease as the basis of our investigations, one great point is gained, and much greater certainty can be given to our ulterior researches, if we compare the symptoms of any fever which is little known and imperfectly described, with those of the typhoid fever, or dothienenteritis, as it is now frequently called from its anatomical lesion.

This inquiry was in accordance with a desire which I had long cherished of investigating the most common fevers in the middle states of America, where, from our geographical position, we witness the fevers observed at the northern, and occasionally those of the southern states. The commercial relations of Philadelphia are so frequent with the whole southern coast of United States, and the passage to the north so rapid in the summer and autumnal months, that we receive into our hospitals a considerable number of patients taken ill on the coast of North Carolina, Virginia, and even Alabama and Louisiana. There are, therefore, few places where such a study could be pursued to more advantage than at Philadelphia. During the last three years of a constant connexion with our largest hospitals, either as resident or attending physician, I have not lost sight of this object of study, and I have already published in the *American Journal* for the year 1835, some cases of the dothienenteritis as well as of the remittent and intermittent fevers.

Dothienenteritis is by no means a rare disease at Philadelphia, although less common than at Paris. In the essay alluded to, I established the identity of the anatomical characters and of the symptoms of the fever, occurring at Philadelphia, with that observed at Paris. I also showed that the patients were chiefly those who had resided but a short time at Philadelphia, and that they were taken ill on ship-board, or under some other circumstances causing an abrupt change of food and habits of life. They were also young persons, but few having passed the age of twenty-five years. Both these conditions of age and change of habit are observed to be essential to the development of typhoid fever at Paris.

Having once established the complete identity of a fever which is so common at Paris and so well described, with a similar affection, not unfrequently met with at Philadelphia, I examined the pathological phenomena of our remittent and intermittent fevers of the severe malignant character so frequently observed along the

southern coast, and sometimes occurring in those malarious parts of the country which are situated within a short distance of Philadelphia. In all these fevers, the glands of Peyer as well as the other intestinal follicles, were found perfectly healthy; the large intestine was occasionally but not constantly diseased, while the stomach, and to a still greater degree the liver and spleen were invariably found in a morbid condition. If the fever proved fatal in the course of the first fortnight, the liver and spleen were softened as well as enlarged; but if the disease assumed a more chronic form, the viscera were hardened as well as hypertrophied. The latter state was the first stage of those chronic lesions which are formed in the livers of patients long affected with remittents or intermittents, and which continue throughout the course of the ascites, which is so common a consequence of these diseases. I made numerous examinations of the bodies of patients who died of the same variety of malignant remittent and intermittent during the summer of 1835, and still more frequently in the epidemic of 1836, a year in which these diseases have been unusually fatal throughout the southern states. The results of these late examinations have confirmed those already obtained, and showed that the follicles of the small intestine are free from lesions, and that the anatomical character of the disease is to be looked for in the spleen, liver, and stomach.

The bilious and yellow fevers are probably referrible to the same class as the malignant remittents, but in yellow fever the disorganization seems to be most extensive in the stomach, whence arises the black vomit, which forms a characteristic symptom of the disease. Bilious fever, or, in other words, the remittent fever attended with unusual alteration of the liver and a disordered secretion of bile, is common with us. Yellow fever is rare, and occurs in an epidemic form at such long intervals, that I have seen but few cases of it.

The typhus fever, which is so common throughout the British dominions, especially in Ireland, is not attended with ulceration or other lesion of the glands of Peyer. From the account of the lesions presented by most of the writers upon the subject, it would seem that there is no constant anatomical lesion, but that the lungs present traces of disease more frequently than any other organ. My own observation of this variety of fever was limited to the examination of the fever patients under the care of the late Dr. Gregory of

the Edinburgh infirmary. This observation was not sufficiently long or accurate to enable me to do more than refer to those physicians who have enjoyed extended facilities for the study of this affection. The lesion of the glands of Peyer is now well known to the British physicians, but an error frequently committed by them is that they regard this affection (dothienenteritis) as a mere complication of their ordinary typhus, or a modified form of it. At least I do not at this moment recollect any one who has clearly stated that the two diseases are always distinct, before the publication of a note in the *Dublin Journal*, by Dr. Lombard of Geneva, (Sept. 1836).

It is not possible to set this matter at rest, unless a series of accurate histories of typhus with detailed symptoms and pathological lesions should be published by British physicians. With the aid of a statement of this kind, such a comparison might be made as to set the points of difference between the ordinary British or Irish typhus and the dothienenteritis of France in their true light. From the information we possess, we should conjecture that the two diseases are widely and entirely different in symptoms, anatomical characters, treatment, and mode of transmission. But the British typhus seems to us to be identical with the disease which forms the subject of the present memoir, and is apparently the same affection which is variously designated: typhus gravior, ship fever, jail fever, camp fever; sometimes petechial or spotted fever. The term typhus mitior of the older writers seems nearly synonymous with that of typhoid fever or dothienenteritis of the French physicians.

In America there have occurred several epidemics of fever more or less similar in their nature to the British typhus. Some of these were confined to the New England States, where they were often known under the name of spotted fever, and are described by North, Hale, and others. Other epidemic diseases of a similar type extended to a larger district of country and overran a considerable portion of the Middle States, causing extensive ravages both in town and country. It was of epidemics of this kind that many distinguished physicians of Philadelphia perished in different years, amongst them were the professors of the University, Rush, Wistar, and Dorsey. No distinct history of the typhus fevers which prevailed at Philadelphia at different periods between the years 1812 and 1820 is on record. I mean such an account of the disease as makes its diagnosis so clear that there can be no danger of confounding it with other analogous affections. The fever was well

studied by the physicians who practiced at that time, but the habit of analyzing symptoms had not been introduced, and their experience, however valuable to themselves, was in a great degree lost for their successors. These remarks are so true, that although an eminent physician of Philadelphia pronounced the epidemic of 1836 to be the same as that of 1812 and succeeding years, another distinguished medical gentleman who was not familiar by his own experience with the former disease, considered them as distinct affections, and that the one which first occurred was a low grade of pulmonary inflammation.

That the fevers were really identical, was proven by the opinion of Dr. Parrish, one of the most experienced physicians of Philadelphia, who practiced very extensively amongst all classes of inhabitants in the winter of 1812-13, and was remarkably successful in his treatment of the prevailing fever. He saw some of the cases at the Philadelphia Hospital in 1836, before the disease had extended to the wealthier classes, and immediately recognised its true character.

For a period of at least ten years there has been no epidemic of this nature at Philadelphia. In the year 1827, a large number of Irish emigrants were ill of a typhoid fever, with ulceration of the small intestines, which was probably dothienenteritis, and during several successive years there were more or less extensive epidemics of remittent and intermittent fevers, occurring in the neighborhood of the city, but not often extending into the central parts of the town. Occasionally, sporadic cases of fever of a comatose or typhoid character would occur, but these cases were nearly always either some form of malignant remittent, or else they occurred during the winter months, and were complicated with pneumonia. The inflammation of the lungs then appeared as the first stage in the disease, which afterwards assumed those cerebral symptoms of stupor and feebleness which have procured for it the designation of pneumonia typhoides. These cases I often witnessed while resident physician of the Almshouse infirmary during the years 1828-30.

At Boston, in the year 1833, there was an epidemic dothienenteritis of extreme gravity and unusually fatal. This fever was well studied by the late James Jackson, Jr., and other physicians, and was proven by them to be identical in symptoms and pathological lesions with the typhoid fever of Paris. Some of the physicians of that city are inclined to regard their former epidemics as of this nature, but this

opinion seems to us more than doubtful. Since the epidemic, the typhoid fever is there a common sporadic disease, rather more frequent apparently than at Philadelphia.

In the winter of 1835-6, there was an unusual number of cases of gangrene of the lungs at the Philadelphia Hospital, and but few of decided pneumonia. Several cases of dothienenteritis occurred in the autumn, but there were few afterwards. During the winter, a form of fever not commonly met with at the hospitals, was observed from time to time. It was characterized by pungent burning heat of the skin, dusky aspect of the countenance, subsultus, delirium, with great stupor and prostration; but there was no diarrhoea, and but few other symptoms referrible to the alimentary canal. It was the disease which afterwards appeared as an epidemic. At first it was not well understood by us, was sometimes confounded with bronchitis or pneumonia typhoides, from the complication of pulmonary disease with the symptoms of the fever. These cases recovered under the use of a mild stimulating and supporting treatment, with one exception, in which death ensued from sloughing of the sacrum and gangrene of the lungs.

In the early part of the month of March, the admissions for the fever were more numerous. They attracted the greater attention from their occurring in groups of several from the same house, and almost all coming from a particular neighborhood. Amongst the very first admitted were seven negroes, the entire population of a cellar in the lower part of the city. The symptoms varied but little in the seven cases, and upon an examination of two of the number who died, no lesion of sufficient importance to account for the symptoms could be detected.

As soon as these patients were admitted, I resolved to note with care the pathological lesions presented by the bodies of most of those who should die of the fever, examine its symptoms and ascertain the influence of therapeutic agents upon it. This research was commenced with a view to obtain more precise notions as to the character of an epidemic which has probably more than once appeared in America, and seems to be endemic in Great Britain and Ireland. It was especially desirable to ascertain if there was a real fundamental difference between the form of disease which prevailed this year and the dothienenteritis which is always to be met with in America, as a sporadic affection. My friend and colleague, Dr. Pennock, had charge of one half the medical wards of the Philadel-

phia Hospital; his observations were conducted at the same time with my own, but the autopsies and the examination of doubtful cases were always made in the presence of both of us. Dr. Pennock noted a large number of cases, and has given me the privilege of adding his collections to my own. They are the more valuable from the familiar knowledge which he obtained of the dothienenteritis in the wards of La Pitié at Paris. Our inquiries were conducted so much in concert, and our opinions as to the symptoms and treatment of the fever were so often compared together, that this memoir is in most respects the expression of the results obtained by our joint labours.

* * *

Pathological Anatomy.—Dr. Pennock and myself examined a very large number of the bodies of those patients who died of the fever. Indeed, during nearly the whole epidemic scarcely a single examination was omitted, excepting in cases where it was impracticable from the removal of the body by the friends, immediately after death, or where putrefaction supervened, as it sometimes did almost immediately after dissolution. In this large number of autopsies, amounting to about fifty, there was but in one case, and that doubtful in its diagnosis, the slightest deviation from the natural appearance of the glands of Peyer. In the case alluded to, in which there had been some diarrhoea, the agglomerated glands of the small intestine were reddened and a little thickened; but there was no ulceration and no thickening or deposit of yellow puriform matter in the submucous tissue. The disease of the glands resembled that sometimes met with in small-pox, scarlet fever or measles, rather than the specific lesion of dothienenteritis. In all other cases, the glands of Peyer were remarkably healthy in this disease, as was the surrounding mucous membrane, which was much more free from vascular injection than it is in cases of various diseases not originally affecting the small intestine.

The mesenteric glands were always found of the normal size, varying, as in health, from the size of a small grain of maize to three or four times these dimensions. With the exception of a slightly livid tint, common to them and the rest of the tissues, they offered nothing peculiar either in consistence or colour.

The spleen was of the normal aspect, in one half the cases, in the other half it was softened, but not enlarged, and in one case out of five or six, enlarged and softened.

Thus, the triple lesion of the glands of Peyer, mesenteric glands and spleen, constituting the anatomical characteristic of the dothienenteritis or typhoid fever, although sought for with the greatest care, evidently did not exist in the epidemic typhus. Indeed, it was a subject of remark, that in the typhus fever the intestines were more free from lesion than in any other disease accompanied by a febrile movement. This exemption extended to the large intestine until the summer heats began, when a few scattering cases offered some symptoms of diarrhoea, during the prevalence of an epidemic dysentery; and, where they terminated fatally, softening and other signs of inflammation of the mucous coat of the colon were observed.

The fact that the morbid changes pathognomonic of dothienenteritis, are not met with in the typhus fever, would of itself seem conclusive that the two diseases are no more identical than pneumonia and pleurisy. Although, in some respects, the two affections are analogous, and even similar, the radical difference of anatomical lesions is at least as well marked as the distinction between the symptoms. It is, indeed, singular that there should of late be a strong tendency to confound two fevers, which were regarded as entirely distinct by some of the older physicians.

SAMUEL D. GROSS

(1805-1884)

*T*EN YEARS after the appearance of Horner's "Treatise on Pathological Anatomy," a much more elaborate text on the subject was issued by SAMUEL D. GROSS, then professor of pathological anatomy in the Medical College of Ohio at Cincinnati. Although American contributions to the development of the science of pathology were few in the first half of the nineteenth century, Gross's "Elements of Pathological Anatomy" (Boston, 1839) shows that its essential principles had been well grasped in this country at this early period. Indeed the veteran pathologist Virchow at a dinner years later showed this book as one of the prizes of his library. Gross gave the first organized courses in the subject in the United States, and closely correlated pathological knowledge and surgical practice all his life. The work cited was in two parts, General and Special, a division of pathology still followed. The three selections are from the first division, that on effusion of serum, or edema, being a fair sample of the excellent character of the work as a teaching medium in general pathology, and the two other selections indicating its extreme usefulness in connection with the practice of surgery.

OF THE EFFUSION OF SERUM

OCCURS, TO A GREATER OR LESS EXTENT, IN ALMOST EVERY INFLAMMATION.—OEDEMA, ANASARCA, AND DROPSY.—COLOR, CONSISTENCE, QUANTITY, AND CHEMICAL COMPOSITION.—USUALLY THE RESULT OF A MILD DEGREE OF INFLAMMATION.—CONCLUSION

An effusion of serum, to a greater or less extent, occurs in almost every inflammation. There are some varieties of this disease in which, indeed, it forms the chief if not the only symptom. It is seen most frequently in the interstices of the cellular tissue, on the surface of the serous membranes, in the parenchymatous texture of the lungs, in hydatids, and serous cysts. There are some structures which, from their dense and compact nature, do not seem to allow of this infiltration. Of this description are the liver, kidney, womb, prostate gland, and spleen, together with the tendons, aponeuroses, ligaments, cartilages, and bones. Very little serum is effused in the

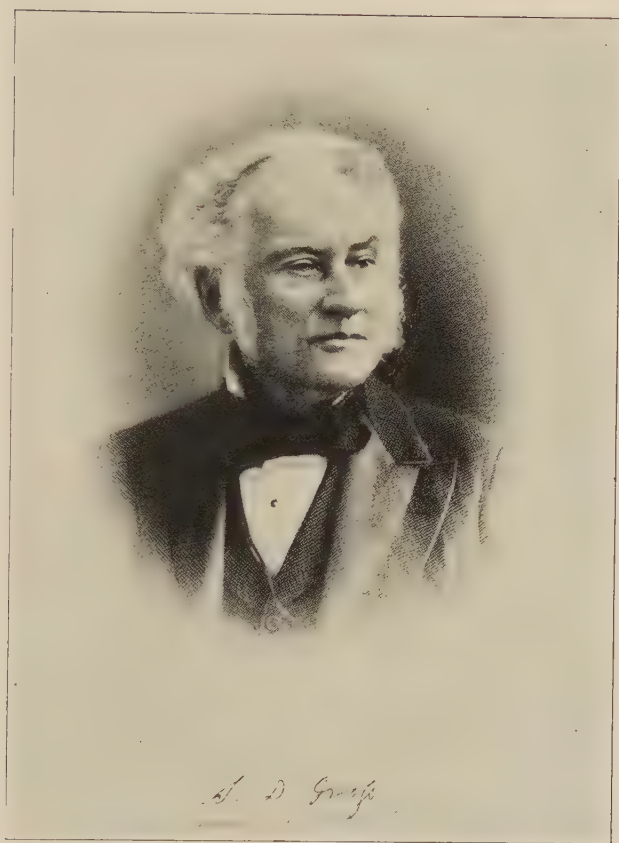


PLATE 22. SAMUEL D. GROSS (1805-84)

brain, spinal cord, nerves, vessels, and mucous membranes. With respect to the latter, the parts most frequently and extensively affected, are the margins of the glottis, the conjunctiva, and the nymphae. Considered in reference to the subcutaneous cellular tissue, the effusion occurs much more frequently in the inferior extremities than in the superior; in the genital organs than in the trunk; in the eyelids than in the face, head, or neck. The lymphatic ganglions and the interfibrillar substance of the muscles are often the seats of considerable serous infiltrations, especially in weak cachetic subjects, or those who are worn out by severe and protracted diseases. Large quantities of this liquid are frequently discharged by the mucous membrane of the bowels, in diarrhoea and cholera. In the skin the most striking exemplification of this effusion is seen in the vesication of an ordinary blister, in burns and scalds, and in the elevation of the cuticle which announces mortification.

Various names are employed to designate these effusions. When the fluid is poured out into the interstices of the subcutaneous cellular tissue, it forms a smooth, pale, glossy swelling, which pits on pressure, and is seldom painful, unless there be considerable inflammation. This is called *oedema*. When this affection occurs in the extremities, it generally varies with the position of the body, being very slight or entirely absent when the limb is elevated, most prominent when it is dependent. The reason of this is obvious. In many cases the fluid is not developed in these parts, but gravitates thither from other regions, making passages for itself through the cellular tissue. As meaning the same thing, the term *anasarca* is sometimes used. The word, however, it should be observed, is generally employed in a more comprehensive sense, to designate the effusion of serum into the meshes of the cellular tissue, in whatever part of the body this structure exists. When the collections occur in the serous sacs, they are called *dropsies*. These, again, are named according to the particular cavities in which they are found. Thus, an accumulation of water in the arachnoid is denominated hydrocephalus; in the spinal canal, hydrorachitis; in the pleura, hydrothorax; in the pericardium, hydropericardium; in the peritoneum, hydroabdominalis; in the vaginal tunic, hydrocele; and hydrarthrosis in the articulations.

The color and consistence of this fluid are liable to considerable diversity. In some situations, as in the arachnoid membrane and

subcutaneous cellular tissue, it is clear and limpid, like the purest spring water; in others, it is more or less viscid, of a pale yellowish tint, and contains flakes of fibrin. A lemon-colored serum is not of unfrequent occurrence in the chest, the vaginal tunic of the testicles, and in the articulations of the extremities. Occasionally the fluid is of a pale reddish color, from the admixture of haematosine, and cases are witnessed where it has the aspect and consistence of coffee-grounds. The latter variety is particularly common in inflammation of the peritonaeum, caused by strangulation. In jaundice, it sometimes contains a yellow coloring matter, like that of the bile: it has also been found to be impregnated with cholesterine and uric acid.

Of the chemical composition of this fluid very little was known until within the last thirty years. For the most important information concerning it, we are principally indebted to Dr. Marcet, of England, to whom animal chemistry generally is under so many obligations. This distinguished physician has developed the interesting fact, that serous liquid, no matter what may be the structure of the organ or tissue furnishing it, is essentially of the same nature. According to the statement which he has published in the second volume of the London Medico-Chirurgical Transactions, the prevailing animal substance is albumen, with a minute quantity of muco-extractive matter, which is uncoagulable, but soluble in water and other fluids. In none of his experiments did he detect any gelatine. The proportion of albumen is subject to much variety, being very abundant in some situations, and almost entirely wanting in others. The principal saline ingredients are soda and potash, in the form of muriates and sulphates, with phosphate of lime, iron, and magnesia. The specific gravity of the effused liquids is generally less than that of the serum of the blood, and their coagulability is always in direct ratio to the amount of albumen. In the fluid of hydrocephalus and spina bifida the quantity of this substance is frequently so small as scarcely to be rendered visible by heat, alcohol, or acids. From all, then, that we know concerning this matter, it may be legitimately inferred that it is perfectly identical with the serum of the blood from which it is derived, differing from it only in specific gravity, and in the relative proportion of its constituents.

The amount of fluid varies, under different circumstances, from a few drops to several gallons. The rapidity with which it is poured

out, even in large quantity, is sometimes surprisingly great. In persons bit by venomous serpents, the whole body often attains an enormous size in the course of a few hours from this source, and some of the internal organs are literally inundated. Usually, however, the effusion takes place more gradually, and, as might be inferred from our previous remarks, never to any extent until the inflammation has attained a certain point. Let me be comprehended. In the serous membranes, which afford this fluid in greatest abundance, one of the first things that happens, when they are irritated, is the suspension of the natural secretion, which is restored and augmented only after the violence of the inflammatory impulse has somewhat abated. If this should not occur, lymph, not serum, will be furnished, either alone or combined with pus or blood; or the individual, the subject of the disease, will perish from its effects; or the part will fall into a state of sphacelus.

It has been already hinted that serous effusion is the result of inflammation, usually of a very mild grade. That this is true, as a general rule, very few will attempt to dispute; the exceptions, if there be any, are certainly very rare, and have not hitherto been satisfactorily pointed out. A few facts clearly and concisely stated, will assist in determining this problem.

It has been alleged, in the first place, that serum is occasionally effused when there is an obstacle simply in the circulation, without any concomitant inflammatory action. It is a matter of common observation with the physician, that anasarca of the lower extremities often arises from obliteration of the femoral, external iliac, and ascending hollow vein; and the face, neck, and arms are frequently loaded with serum from compression of the vessels whose duty it is to return the blood to the right side of the heart. When the portal vein, or any one of its principal branches, is obstructed, abdominal dropsy, or ascites, follows. Contraction of the right auriculo-ventricular orifice, or disease of the valves of the pulmonary artery, impeding the passage of the blood, and compelling it to regurgitate into the inferior cava, produces the same result, together with oedema of the legs and feet. These examples will be sufficient for the subject which they are intended to illustrate. Let us now endeavor to ascertain how far they are dependent upon inflammation, or whether they are the result merely of mechanical obstruction? It is frequently extremely difficult to ascertain the condition of the seat of the effusion by anatomical inspection. In ascites how

often does it not happen that there is the most copious accumulation of water, caused obviously by inflammation! and yet, on examination after death, there is scarcely a well-marked trace of the latter malady. That there are cases, then, of serous effusions, in which the ordinary phenomena of phlegmasia, particularly the discoloration, entirely vanish on the approach of death, or during the last struggles of life, cannot be doubted; indeed, it is not improbable, I think, that there are instances in which this disposition occurs a long time before the individual expires. The absence of redness, therefore, does not prove that there was no inflammation; for the existence of this lesion is sufficiently evinced by the presence of the watery accumulation, and the opacity of the affected membrane. Should there be, in addition, specks, patches, or bands of fibrin, all doubt on the subject must vanish.

Such, then, being the difficulty of recognizing the presence of inflammation, where every symptom during life gives indubitable evidence of its existence, can it be wondered at that, in the instances above referred to, pathologists should still consider the effusion of serum as the result merely of mechanical obstruction? The question may now be asked,—can such an obstruction exist, to any considerable extent, without producing a state of parts analogous to, if not really identical with, inflammation? I would answer, no. Let it be supposed that the obstacle exists in the ascending hollow vein. This vessel is destined to return the blood from the inferior extremities, the pelvis and abdomen, to the right side of the heart. But, failing in the accomplishment of this object, from the difficulty adverted to, the blood is interrupted in its passage upwards, and congestion of all the vessels, both large and small, is the result. This congestion is not transient, but permanent; and it is scarcely reasonable to presume, judging from our knowledge of the circulation, that this state could exist long without producing an altered condition of the sensibility of the parts affected, attended with more or less redness, and effusion of serosity. The peritonaeum and cellular tissue of the limbs are the structures which receive the brunt of the difficulty, and these are parts, it is well known, which are most liberally supplied with serous capillaries. But, it may be said that the effusion may result from perverted action, from irritation, or disturbed function: all this may be true, and yet not in the least invalidate our position. Everybody knows that in inflammation there is perverted action, or deranged function,

with irritation, or altered sensibility. These terms, therefore, if they mean anything at all, only denote certain conditions—not the cause of these conditions; as redness, heat, pain, and turgescence are not inflammation, but only so many symptoms of it.

The preceding remarks are equally applicable to the watery effusions of the serous textures, which occur in association with organic diseases of the glandular and parenchymatous viscera. A large scirrhus tumor of the liver, seated so superficially as to encroach upon and fret its serous investment, is often attended with ascites, although the portal circulation is in no wise obstructed or embarrassed. In the same manner hydrothorax is sometimes induced by tubercles of the lungs; hydrocele by carcinoma of the testicle; hydrocephalus by heterologous growths of the brain. In all these instances the effusion of water is the result, unquestionably, of inflammation, lighted up in the serous covering of the respective organs, by the morbid deposit acting in the capacity of a foreign substance. The dropsical accumulations which supervene upon scarlet fever, measles, and other eruptive diseases, can be traced, in most cases, directly to phlegmasial irritation of the serous membranes.

Taking into consideration the preceding facts, and the reasoning founded upon them, the conclusion is obvious that the effusion of serosity, no matter in what part, organ, or region it occurs, is the result, *invariably*, of a process analogous to, if not strictly identical with, inflammation. This process, we repeat, is often very imperfectly marked, both during life and after death, so that the ordinary phenomena of phlegmasia are in no way manifest to our senses. That this conclusion is fully borne out by the premises, is, I think, sufficiently evident; and we shall, therefore, dismiss the subject, in the hope that what has been stated will have a tendency, at least, to arouse the attention of the profession to further investigation respecting it.

OF GRANULATION

IMPORTANCE OF THE SUBJECT.—NATURE OF GRANULATIONS.—
DIFFERENCE IN REGARD TO THEIR VASCULARITY AND SENSIBILITY.—

HOW MODIFIED BY TEXTURE.—ARE SECRETING
AND ABSORBING ORGANS.

Leaving the subject of ulceration, I now come, by an easy transition, to speak of that of granulation. This process, like that of

union by the first intention, is one of the grand operations employed by nature for the cure of wounds, and the filling up of ulcers. To the surgeon, a knowledge of this process is of indispensable importance; whilst to the inquisitive physiologist it discloses a series of changes, which, in point of interest, are not surpassed by any in the animal frame, whether in a sound or diseased state.

A granulation is a small, vascular body, generally somewhat mammillated in shape, more or less red, sensitive, and capable of secreting pus. It consists, in the first instance, essentially of coagulating lymph; and the process by which it is formed is very similar to that which is concerned in union by the first intention. Let me be understood. An individual receives a wound involving the skin and cellular tissue. The edges, instead of being brought into contact, are allowed to remain apart. Immediate adhesion being thus prevented, another process, more complex and tardy, is instituted. The sore now becomes painful, and, in short, exhibits all the ordinary phenomena of inflammation. A thin, watery fluid oozes from its surface; and, after some hours,—generally from six to twenty-four,—it is found to be slightly incrustated with lymph, by which its interstices are filled up, and the whole is made to assume a smooth, uniform appearance. The layer thus formed is of a whitish color, somewhat ropy in its consistence, homogeneous, and easily wiped away. If it be allowed to remain, in the course of a short time, varying from one to two days, sooner or later, according to the activity of the sore, the exudation becomes organized by the subjacent old vessels extending into it, or, if we adopt the opinion of some, by the formation of new ones, which inosculate with those of the divided parts. The surface of the sore is now of a red color, readily bleeds if it be touched, and is elevated into a great number of little rounded bodies, closely aggregated together, which are the rudimentary granulations. Another layer of plastic lymph is next effused, the vessels are still further elongated, and thus incrustation after incrustation is formed and organized, until the cavity is finally filled up.

Not only does each granulation receive one or more arterial and venous branches, but, in all probability, also a small nerve and an absorbent. Such, at least, must be our conclusion, when we reflect upon the fact, that this little body not only bleeds when roughly handled, but that it often becomes highly sensitive, and that it readily absorbs such substances as are placed in contact with it.

The vascularity of these little bodies is much greater, I am disposed to think, than is usually imagined. That they are liberally supplied with vessels is at once indicated by their florid complexion, by the astonishing rapidity of their growth, by the facility with which they bleed when touched, and by the fact that they become hard and tumid if filled with injecting matter. The arteries, the precise number of which is not known, having entered the base of each elevation, soon separate into arborescent branches, which freely anastomose with each other, as well as with those in the granulations immediately around. Accompanying these arteries are corresponding veins, which carry away the blood which is not required for the nourishment of the part, the effusion of lymph, and the secretion of pus, with which the abraded surface is usually covered. Whether the nerves and absorbents are of new formation, or merely elongations of those that previously existed, it is impossible to determine. The latter supposition is probably the true one.

Granulations are often very sensitive. This, however, is not the case everywhere, or under all circumstances. In the cutaneous and cellular tissues, the granulations are, all other things being equal, infinitely more sensitive than in the tendons, aponeuroses, and ligaments. The same thing is true with respect to the granulations of the bones, except when they spring from the cancellated structure; then they are frequently so tender that it is impossible to touch them without inducing severe pain. These little bodies are also more sensitive when there is much inflammation, and in persons of an irritable and worn-out constitution than in such as are healthy and robust. In some instances, especially in old ulcers of the leg, they are more than triple the ordinary size, extremely pale, cold, apparently infiltrated with serosity, and so completely insensible that they may be cut without the least pain.

Granulations are absorbing as well as secreting bodies. These properties, however, are not equally well marked in all the tissues. A great difference, for instance, exists in this respect between the granulations which arise from the skin and those which arise from the bones, the former absorbing and secreting with great rapidity, while the latter perform these offices very slowly and imperfectly. A knowledge of this fact is of no little value in the practice of surgery, as it enables us, on the one hand, to avoid stimulating dressings, and, on the other, the application of such substances as have a tendency, when absorbed into the system, to give rise to

dangerous results. Not a few cases are on record where arsenic, corrosive sublimate, and other articles of the *materia medica*, placed in contact with a granulating sore, have destroyed life. The extract of belladonna, used in this way, will produce temporary amaurosis, mercury will salivate, and opium, it is well known, will occasion sleep nearly as soon as when introduced into the stomach.

Thus, granulations are a very interesting and important set of textures, extremely complex in their structure, and performing the triple office of pouring out lymph, secreting pus, and absorbing such substances, to a greater or less extent, as are brought in contact with them. The facility with which they are developed is much greater in some tissues than in others, depending on the degree of laxity and vascularity of the part from which they spring. The concomitant inflammation appears also to be of a mixed character, as it is attended with the simultaneous effusion of lymph, and purulent matter; and it is important that the phlogistic action should not transcend certain bounds, otherwise the process will be interrupted, retarded, or wholly suspended. The skin and cellular substance appear, of all other tissues, to be most susceptible of granulation. Mucous membranes, aponeuroses, ligaments, tendons, cartilages, and bones, together with the internal viscera, excepting, perhaps, the brain, rarely heal in this way, and then only after a long time.

OF CICATRIZATION

NATURE OF THE PROCESS.—DIFFERENT STEPS.—DO ULCERS NEVER HEAL FROM THE CENTRE?—PROCESS OF CICATRIZATION INFLUENCED BY THE FORM AND SITUATION OF THE SORE.—MEANING OF THE TERM CICATRICE.—REPRODUCTION OF THE ORIGINAL TISSUES.

The subject next in order is cicatrization. The remarks which I shall offer here must necessarily be brief, as a great deal of what might be said will more appropriately come in under the head of the different organs and tissues.

Cicatrization is the process which nature employs to heal wounds and ulcers. It is the finishing stroke, if the expression be allowable, of granulation,—the labor which is necessary to polish the surface of the sore, to contract its diameter, and to bring it as nearly as possible to a level with the surrounding structures. This process, although it is not limited to the skin, as might be inferred from

reading some modern treatises on surgery, is yet most advantageously studied there, as it enables us to follow nature as it were in the different steps which she employs with a view of accomplishing her enterprise.

The first step in the healing of an ulcer seems to be the subsidence of the inflammation, which becomes gradually less and less, until the surrounding parts regain their natural color, form, and consistence. The sore at the same time sensibly diminishes in diameter, by the contraction and coalescence of its granulations; and its surface, instead of being rough and uneven, assumes a smooth, glassy appearance, its centre, however, being still considerably depressed; or, if the granulations have been very exuberant, unnaturally elevated. Cicatrization is now observed to begin, the first indication of it being a thin, delicate, bluish pellicle, placed along the margin of the breach, where it soon unites with the old skin by an interchange of vessels, nerves, and absorbents. If the part be inspected at a later period, the substance that was thus deposited and organized, will be found to have increased in thickness and density, and to be gradually extending itself towards the centre of the ulcer by the addition of new matter. It is in this manner, by this successive experipheral action, that the denuded surface is eventually covered over.

But do ulcers and wounds never heal from the centre? This is a topic concerning which pathologists have expressed different sentiments—some maintaining the affirmative, others the negative side of the question. From an inspection of numerous cases, I am convinced that the process of cicatrization takes place only in one way, namely, in that which I have described. To this remark there is but a single exception. In extensive wounds, especially of the lacerated kind, it often happens that portions of the original skin remain, forming so many little patches in the midst of the abraded surface. In such cases, the cicatrization goes on simultaneously around these parts and along the principal edges of the solution of continuity. There is, however, no new law in operation here, the old skin being the starting point of the new one in both instances.

The process of cicatrization is much influenced by the form and situation of the sore. Circular-shaped breeches of continuity heal much slower, *caeteris paribus*, than such as are longitudinal, for the obvious reason that it takes the new skin a much longer time to reach the centre in the former than in the latter. A sore in the leg

cicatrizes with more difficulty than one on the trunk; and a callous ulcer than a soft one.

When the cure is completed, a *cicatrice* is left, or, as it is called in familiar language, a scar. This is, of course, always much smaller than the original sore, and still further diminishes by the contraction of the new skin. When the breach of continuity has been of great extent, as when it has been produced by a burn, this contraction is often a source of great mischief and deformity. At first, the cicatrix is extremely vascular, soft and of a bluish color: afterwards the vessels decrease in size and number, and the part becomes dense, bloodless, and whiter than the original skin. This is well seen in persons who have had confluent small-pox, or in those who have been covered with venereal blotches.

Are the original textures, in the formation of cicatrices, always regenerated? and, if so, in what respect, if any, do they differ from them? Cartilages and muscles are said to be the only parts which are not susceptible of being reproduced. But even of this I feel extremely doubtful; certain am I that I have seen muscles, which were almost entirely torn asunder, unite through the medium of fleshy matter. Very recently, I had under my charge a healthy lad, eleven years old, who had a large piece of the great pectoral and broad dorsal muscles torn away by a steam-engine, in which the breach of continuity was repaired by a substance perfectly identical with the original. The granulations were unusually florid, highly sensitive, and grew with astonishing rapidity. In old subjects, it is not improbable that the junction is sometimes effected by tendon. The cartilages of the ribs generally unite by osseous matter, as certain pieces of the skeleton, such as the patella, the olecranon process, and the neck of the femur, do by cartilaginous.

In most instances, however, the reproduction is imperfect. This is the case even with the skin. The cutis is never so strong or so capable of resisting the effects of disease, as in the normal state; its inner surface is not reticulated, nor is it provided with sebaceous follicles. The mucous network is but imperfectly regenerated, and the epidermis drops constantly off in thin, dry, furfuraceous scales. No hairs are to be seen in the scar; for their roots having been destroyed, they cannot of course be reproduced. The same imperfect development is observed in the cicatrization of the mucous or some other tissues.

GABRIEL ANDRAL

(1797-1876)

ONE OF the most successful and influential teachers of the French school of medicine was GABRIEL ANDRAL, who held the chair of General Pathology and Therapeutics in Paris from 1839-66. His "Clinique médicale" achieved a wide reputation and did much to hold the current French premiership in correlated internal medicine and morbid anatomy. His special and highly productive labors in the field of blood analysis had much to do with the establishment of hematology as an independent branch of pathology. In this development he had the early advice of the distinguished chemist Jean-Baptiste Dumas and the collaboration of Jules Gavarret and other able, younger chemists. The fashion of the day in therapeutic bleeding made available large quantities of blood permitting analysis by the relatively crude chemical methods of the period. It is interesting to note that at present, when bleeding as a therapeutic measure has almost gone out of practice, modern refinement of chemical technique has saved this science from disappearing, by making possible the accurate utilization of relatively minute quantities of blood in those purposes for which Andral used cupfuls. The selections here presented are from his "Essai d'hématologie pathologique" (1843).¹

In different individuals of the same species, supposed always to be in a healthy condition, the different elements of the blood may present variations in their quantity, which however always remain within certain limits. There results from this, for each of these elements, a maximum and a minimum above and below which the physiological condition can no longer exist, while that condition is compatible with this maximum and minimum, as well as with all the intermediate proportions.

The average of the fibrine, in human blood, is in the physiological condition, 3/1000. I have shown elsewhere that the value of this proportion could not be impaired by other numbers that have been given by some experimentalists as representing the normal quantity of the fibrine of the blood. (See answer to objections brought against

¹ Translation by J. F. Meigs and Alfred Stillé, Philadelphia, 1844.

the analysis of the blood, etc.) In healthy individuals, the fibrine may vibrate about this average, so as to fall to the proportion of 2.5, or to rise to the proportion 3.5, without the physiological state being thereby destroyed. There are some persons even, who without being sick, may have in their blood nearly 4 in fibrine, or in whom this element may fall as low as 2. But these are, we must admit, maxima and minima very rarely compatible with the physiological condition; they should be regarded as a kind of exceptional proportions which belong only to true idiosyncrasies.

In taking the proportion 127/1000 as that which represents the average of the globules in human blood, we find, in the physiological condition, as the maximum of the globules the proportion 140, and as minimum the proportion 110. But this maximum 140 is linked with the plethoric condition, which, by development becomes a true morbid state. Force of constitution is the condition of the economy which most contributes to raise the globules towards their maximum, while congenital or acquired debility is that which lowers them towards the minimum.

The solid materials of the serum, which are composed almost exclusively of albumen, present, above and below their mean 80, a certain number of proportions which are equally compatible with the preservation of health; but there is likewise for these materials, and consequently for the albumen, a certain degree of diminution which I have never met with, without there being at the same time disease.

Independently of the individual constitutions which introduce into these proportions the variations that I have just signalized, there are still, independent of disease, some circumstances which may equally cause these proportions to rise or to fall, without our being able to accuse therefrom any disease. Thus I have shown in my first memoir that emissions of blood and the deprivation of aliment have for constant effect to diminish the amount of the globules, while the fibrine is much less rapidly and necessarily influenced in this way. I have begun some experiments with a view to determine to what point we may succeed in modifying the proportion of the various elements of the blood, by giving to animals a more or less substantial nutriment. These experiments are not yet sufficiently advanced to enable me to make known positively the results: they will be published in a subsequent work, but I

have thought proper to mention them here, as entering into the general plan of the researches in which I am engaged.

Happen what may, what I have just said suffices to show how important it is to have determined with some rigour, for the physiological condition, the possible variations of quantity that the different elements of the blood may present, before pursuing these analyses in the pathological condition.

OF THE BLOOD IN ANAEMIA

I have just pointed out what may result in the organism, in the state of health and of disease, from an excess of the globular element of the blood. But there are cases also in which this fluid comes to present a character precisely inverse, that is to say when its amount of globules falls much below the physiological mean, and diminishing more and more, reaches a proportion so low that we can scarcely comprehend how, with so few globules in the blood, life can still be maintained.

This diminution, in different degrees, of the globular element of the blood is the fundamental character of anaemia, a condition which, therefore, in regard to the composition of the sanguine fluid, as well as in relation to its symptoms, is the opposite of plethora. According to the degree of the diminution of the globules, this condition is still compatible with a certain amount of health, or it becomes by itself a true morbid state, which may exist alone, or intervene as complication in all diseases. Thus then, independent of the solids, we find one of the principles of the blood, becoming distinct from all the others, exercising, sometimes by its augmentation, and sometimes by its spontaneous diminution, an influence such as to become the point of departure and the sole appreciable material element of a considerable number of diseases.

I have found, as the average of the proportion of the globules, in 16 cases of commencing anaemia, the cipher 109, and in 24 cases of confirmed anemia, the cipher 65. I have constructed these averages only from cases of spontaneous anaemia occurring in the human race; I should have found a lower average in the sheep kind, which are also exposed to become anaemic, and which, in this condition, may have a blood so deficient in globules, that I have seen one of them which had but 15 of those corpuscles (see *Memoir*, etc.), whilst in the human race, the lowest proportion of

globules that I have ever met with in spontaneous anaemia is 28. It is true that man possesses normally in his blood more of the globules than does the sheep species; whence it follows that, proportionally to the physiological condition, the minimum 28 of globules, found in the spontaneous anaemia of man, is very nearly equal to the minimum 15 found in anaemic sheep.

Besides, it is necessary to distinguish several kinds of anaemia, according to the modifications of composition that they produce in the blood.

In spontaneous anaemia, whether strongly marked or not, the globules alone are diminished: the fibrine and the solid matter of the serum have preserved their normal proportions; thus in 16 cases of slight anaemia, I have found as the average of fibrine the cipher 3.0; and in 24 cases of confirmed anaemia the cipher 3.3.

In the anaemia which follows more or less abundant losses of blood, it may equally happen that we shall find the globules alone diminished; that is indeed the first effect of every hemorrhage; but if this augments or is renewed, there soon arrives a moment when the blood comes to lose equally its other principles, and we see the albumen and the fibrine of the serum diminish with the globules. It is in this way that in a woman who had suffered from very abundant attacks of metrorrhagia, the blood contained only 21 in globules, 1.8 in fibrine, and 61 of solid matter of the serum. The water had risen to the enormous proportion of 915.

Anaemia may also be the result of certain appreciable modifications of the organism which exercise an influence on the blood. In this case, the composition of that fluid appears to be the same as in spontaneous anaemia, that is to say the globules alone are diminished, while the fibrine and albumen of the serum remain the same. This is what occurs in many pregnant women whose blood loses its globules without losing its fibrine. The average of the globules is the same in them as we have found it in cases of slight anaemia.

Why is it that woman is more exposed than man to this singular alteration of the blood in virtue of which, without any evident cause, the globules of this fluid are thus diminished in so strong a proportion? Why is she particularly exposed to it at a certain epoch of her life?

Yet men also are sometimes attacked with spontaneous anaemia; they present in such a case all the symptoms which characterize the chlorosis of the female, and I have proved that their blood then

suffers the same alteration of composition; it is with them equally the globules alone which diminish; the fibrine and the solid matter of the serum remain the same. I have met with examples of this spontaneous diminution of the globules both in men still young, and in others aged from forty to sixty years.

When the influence of lead has acted for a long time upon the human constitution, there may result from it the production of a cachectic condition, very well described by Doctor Tanquerel; I have found that, in this condition, the globules of the blood suffer as great a diminution as in spontaneous anaemia, and, as in this latter, the fibrine and other elements of the blood preserve their normal quantity. This effect of the saturnine intoxication repeated or prolonged is certainly very remarkable.

It would be very curious to know whether the globules at the same time that they are diminished in quantity in anaemia, do not become altered also in their structure, and tend to undergo a true destruction. I announced in my course at the Faculté in 1840-41, the results that some microscopic researches undertaken with this view have yielded me. It seemed to me, in two cases of chlorosis, that the globules were become smaller than we generally see them, and at the same time a certain number had no longer their accustomed form; they appeared in the field of the microscope, as though broken, and disseminated, like kinds of fragments. A young girl who presented me this singular condition of the globules, on the 6th of December, 1840, was perfectly cured two months later; her constitution had even undergone such a matamorphosis, that it had gradually arrived under our own observation at a plethoric condition; the 14th of February 1841, I was obliged to bleed her, and her blood then presented me very beautiful globules, extremely different from those that I had observed in December.

OF THE BLOOD IN THE PHLEGMASIAE

No matter, then, what may be the state of the system, the super-vention of an acute phlegmasia involves necessarily, and in every case, the increase of the fibrine of the blood beyond its normal quantity. This law, too, prevails amongst animals, as well as amongst men, as I have become well assured by analyzing the blood of dogs, horses, neat-cattle, and sheep, attacked with various inflammations which had been discovered during life, and after death.

In man, when an acute inflammation is well established, the fibrine varies in quantity between 6 and 8; in a smaller number of cases it rises as high as between 8 and 9; and, more rarely still, exceeds the latter number, and reaches by degrees $10\frac{1}{2}$, which is the highest number I have yet found representing the fibrine in phlegmasiae attacking the human race, though in a neat affected with pneumonia I found it as high as 13. It must be remarked here, that since the physiological number representing the fibrine in animals is not the same as that for man, the increment in the former must not be judged of by the standards of the latter, but must be referred to the average obtained for each particular class of animals. Thus the physiological mean of the fibrine in dog's blood being only 2.1, the numbers 3, 4, and 5 obtained when this animal was attacked with inflammation, would, in the case of man, indicate a development of fibrine to be represented by much higher numbers. On the other hand, the physiological mean of the fibrine in the blood of horses and neat-cattle being greater than that of man, the number 13 indicating the quantity of fibrine in the blood of one of these animals, would, in the case of man, represent a much inferior quantity. These corrections are indispensable, if we desire profitably to apply to human pathology the results obtained from studying the pathology of other species.

In regard to the cases in which the fibrine falls below 5, they are either acute and slight inflammations, and which can hardly be said to have commenced, or whose activity and extent are inconsiderable; in them it may happen that the fibrine falls from 5 to $4\frac{1}{2}$, and sometimes even to 4; but this last number represents the lowest possible, and, as it were, exceptional limit, of the quantity of fibrine in the acute or subacute inflammatory state.

To demonstrate the sudden change of composition which takes place in the blood of persons attacked with acute phlegmasiae, I might cite several cases in which the same person having been bled, some days before the outset of the phlegmasia, and again during the course thereof, his blood, which contained the normal quantity of fibrine at the first depletion, was much more abundantly provided with it at the subsequent ones.

The two diseases in which I have noticed the greatest development of fibrine, are pneumonia, and acute articular rheumatism; they are the only ones in which this augmentation reached the number 10.

Out of 84 bleedings performed in the course of well marked cases of pneumonia, there were seven only in which the fibrine varied in quantity between 4 and 5; in the 77 others it exceeded the latter number, was eleven times between 5 and 6, nineteen times between 6 and 7, fifteen times between 7 and 8, seventeen times between 8 and 9, nine times between 9 and 10, and six times at, or a little above, 10.

CARL ROKITANSKY

(1804-1878)

THE PRESENT Vienna school of medicine, which has been of incalculable influence as a teaching force in medical science, owes much of its prestige to CARL ROKITANSKY. Under this man, with a wealth of material available for his study in the Allgemeines Krankenhaus, post-mortem examinations were made on a stupendous scale, an enormous number by Rokitansky's own hand. An early correlation of this huge individual experience was brought out in 1842-6 by Rokitansky in the form of a "Lehrbuch der pathologischen Anatomie," a work with much theoretical generalization as well as objective description. It is noteworthy for its convenient, if non-etiological, classification of morbid anatomy, and, as would be expected from the source, comprehensive in its scope. Unfortunately its pages included Rokitansky's own cherished humoral pathology, to which he had devoted the unrestrained weavings of a far too seductive imagination. The cellularity of life had just been disclosed by the investigations of Schleiden and Schwann, who taught erroneously, however, that body cells developed de novo from a primitive formational fluid. Blind for the moment to the greater possibilities of these cells, or perhaps in a mistaken effort to begin at the bottom, Rokitansky set upon the formative fluid for an explanation of the manifestations of pathology.

On this unsubstantial foundation he built a doctrine of "crases" and "dyscrases" in which supposed individual constitutional anomalies of the primitive fluid accounted for a huge variety of pathologic changes. This teaching was overwhelmed in the year of its appearance (1846) by the logic of the rising young pathologist Rudolf Virchow, to be sadly discarded by Rokitansky in the preparation of his second edition. Short as was its life, however, its imprint on medical thought, already moulded in the new teaching of Schleiden and Schwann, was profound, and for that reason a somewhat lengthy selection from the "Lehrbuch," exhibiting Rokitansky's views of 1846, is given here. It would be unfair, however, to leave this master pathologist with no more favorable representation. Other selections from the same source are therefore presented, revealing his descriptive powers and wide knowledge of actual lesions. Rokitansky was a great student of diseases

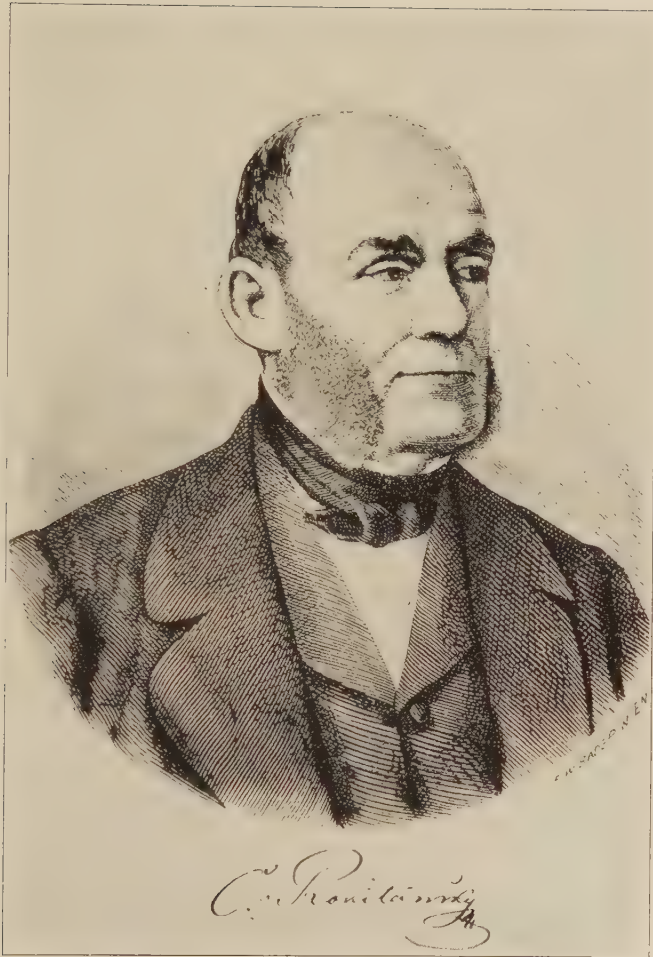


PLATE 23. CARL ROKITANSKY (1804-78)

of the heart and blood vessels, on which in later years he published two important monographs. He was particularly interested in congenital malformation. Part of his treatment of the latter subject, taken from the "Lehrbuch," is, accordingly, presented here. The translations are from the Sydenham Society edition of 1849-54.

BLOOD DISEASES

DYSCRASES¹

Humoral pathology is simply a requirement of common practical sense; and it has always held a place in medical science, although the limits of its domain have, no doubt, been variously circumscribed or interpreted at different times. Of late years it has met with a new basis and support in morbid anatomy, which, in the inadequacy of its discoveries in the solids to account for disease and death, has been compelled to seek for an extension of its boundary through a direct examination of the blood itself.

Not alone has pathological anatomy demonstrated the existence of blood diseases in unlooked for detail; it has at the same time solved a problem of the weightiest import. It has, we think, decided in favour of a humoral pathology, by demonstrating a primitive anomaly of blastemata; by demonstrating the endogenous impairment of the blood within the vascular system, in the inflammatory process, as the basis of the variations in exudates (blastemata); lastly, by demonstrating the dependence of local morbid action upon pre-existent impairment of the general circulation. Our attention will be here directed to diseases of the blood in its totality, and to local dyscrasial processes, with inflammation at their head, only in so far as these offer the basis and starting-point for consecutive disease of the entire blood-mass. It is remarkable, however, and no less important for practice than for science, that the essential forms of these local dyscrasial processes,—perhaps of all local dyscrasial disease,—occur, likewise, as primitive affections of the entire blood-mass. This is proved by the varied character of the products of the inflammatory dyscrasial process, and a comparison in detail of these products with anomalies of the general blood-crisis. Thus, primitive pyaemia, fibrin-crises, sepsis of the blood, severally occur independently of all local beginning, and of all infection.

¹ Translation by William Edward Swaine, 1854.

There are, indeed, two ways of investigating and recognizing blood-diseases: first, the *anatomical examination* of the blood in the dead subject, or of blood obtained during life through spontaneous or artificial hemorrhage; and secondly, *chemical analysis*. Both kinds of investigation should be supported, and the results controlled, by a concurrent examination of the secretions and excretions, of the general condition of the solids, and of new-formations, especially of such exsudates as are the offspring of inflammation.

In fine, both kinds of research should go hand in hand. For, although a deeper insight into the changes suffered by the blood may be reserved for chemistry, it must needs be based upon sound anatomico-humoral premises. Up to the present day chemistry has not taken this duly into consideration, so that as yet this science cannot be said to have far excelled the achievements of a circumspect anatomical survey, notwithstanding the limited resources at the disposal of the latter.

Upon the chemical pathologist we would strongly urge an unremitting prosecution of his researches. We would recommend him to direct his labours more particularly towards ascertaining the precise character of the impairment suffered by the proximate ingredients of the blood, and of the anomalies impressed upon its elementary composition. The interests of haemato-pathology would after all, perhaps, be best served by the examination, in the above sense, of blood taken from the dead subject, the diagnosis of the case having previously received the light of a general post-mortem examination.

Our own task in these pages will be limited to establishing a purely anatomical pathology of the blood; we shall therefore restrict ourselves, as nearly as possible, to anatomical facts, although without neglecting to avail ourselves of the collateral support of such chemical data as may be relied upon at the present hour.

It is the business of pathological anatomy to determine both the physical properties of the blood in its totality, and also the relative quantity, and more especially the quality, of its more immediate components. The two main components which come peculiarly within its province are, first, those essential form-elements, the *blood-globules*; and secondly, the spontaneously separating, coagulating, solidifying *fibrin*,—that component which, owing to its varying tendency to become organized, is, in an anatomical sense, the most important of all. We will here *summarily refer to what has*

been said in the introduction to the doctrine of blastemata and to the section on exsudates, and then proceed to treat of *blood diseases* in what would appear to be their most natural order. The subject is, however, so intimately allied to that treated of in the chapters referred to, that a certain amount of repetition will, perhaps, be unavoidable in the following pages.

Affections of the blood are, like those of the solids, either *primitive* or *consecutive*. And again, the former, equally with the latter, suggest an inquiry as to whether they result from an immediate influence of the morbid agent upon the blood or are determined by the nervous system, as the actual percipient, alienated both in matter and in function. This question can, however, hardly affect us in this place, since the latter view mainly rests on speculative grounds, and upon the fact that obvious injury to, or sensible anatomical disturbance of, the nervous system sooner or later results in disease of the blood.

The latter are determined in very different ways by anomalies in the solids. Thus, the hindered eliminating activity of an organ occasions retention of effete matter in the blood; an abnormal plastic process influences the blood crisis, directly or indirectly, through the anomaly in the interchange of matter. Take for example, the infection of the blood within the range of an inflammation.

To diseases of the solids, as local morbid processes in the broadest sense, affections of the blood stand in a two-fold relation:

1. *The anomalous crisis is a pre-existent one—the primitive affection; the local disease a localization thereof—the secondary affection.* The point of localization, apart from the effect of concurrent external influences, is determined by a specific relation of the crisis to certain organs presided over by the nerves. The forms it assumes are chiefly those of hyperaemia and stasis—inflammation, absolute stasis,—exsudation, or, without the latter, a product-formation completed within the blood-vessels; for instance, spontaneous coagulation of diseased fibrin, pus formation within a greater blood-vessel or within the capillaries of an organ.

The relation of the various crises to the organs and textures, nay, even to particular sections of organs, is manifold. Thus, the croupous fibrin-crises evince a very marked preference for the mucous membrane of the air-passages, and for the lungs themselves; the typhus-crisis, for the mucous membrane of the ileum;

the exanthematous crases, for the common integument and for mucous membranes.

2. *The anomaly of the general crasis is consecutive; that is, the consequence of a local disease, and especially of local dyscrasial processes, whereof the products are taken up into and affect the general blood-mass.* This happens—

(a) Through resorption of the effused products by means of the lymphatics, or immediately into the veins.

(b) Through reception into patent blood-vessels. This process includes the reception of products thrown out into the cavity of larger blood-vessels,—pus, for example.

(c) Most of all, through the off-flowing, and the return into the veins, of plasma degraded in the local process, in a manner corresponding with the quality of the exsudate. (See “relation of the inflammatory process to the crasis.”)

It is, however, to be understood that, neither does a dyscrasis necessarily always become localized, nor a local dyscrasial process invariably give rise to a consecutive dyscrasis of the entire circulation. In the former case, a certain degree of intensity of the dyscrasis is no doubt requisite; in the latter case, the reception of a sufficient quantity of plasma, degraded in the manner aforesaid by the local process, or else of a heterogeneously diseased,—for example, of an ichorous or septically constituted—plasma is indispensable.

Blood diseases are, moreover, either protopathic, whereby we mean developed out of the normal crasis, or deuteropathic, that is created out of another anomalous crasis. (Meta-schematism.) Deuteropathic crases occur in the simplest manner, as impoverishment of the blood in one or more ingredients, drained away by excessive deposition into textures or upon membranous expansions.

Blood diseases are both acute and chronic, and they are marked accordingly by the rapidity or by the slowness of their career. This is contingent upon the character of the dyscrasis, upon its grade, and upon the significance of the organ in which it becomes localized.

They issue:

(a) *In transition to the normal blood-crisis.* This occurs under various conditions, for the most part obscure; for example, under the return of the free function of an organ, under exhausting localization of the dyscrasis in one of the aforesaid processes, or in some secretion. In this way tuberculosis and cancer may lose their

general import and become local affections, which either go on vegetating under the normal condition of the blood, or enter into a retrograde metamorphosis.

(b) *In transition to another anomalous crisis*, (meta-schematism). Such transitions are multiform, some of them appearing to be necessary conversions when the original crisis is at its acme, others to represent the final wearing out of some component of the blood. With respect to others, however, we are still in every way completely in the dark.

(c) *In death*, not only through overwhelming localization in vital organs, often coupled with palsy of their function; not only through exhaustion of organic matter and of the powers of life, owing to redundant local production; but also, in many instances, through unfitness of the dyscrasial blood for the upholding of processes essential to life, for the maintenance of nutrition generally, but especially of respiration and of the energies of the entire nervous system, both central and peripheral.

* * *

FIBRIN-CRASES

The fibrin-crisis occurs in several most important forms and varieties, which the term hyperinosis—as designating a frequent but by no means necessary and invariable excess in the quantity of fibrin—does not sufficiently characterize. It overlooks the far more important, and, for the most part, very marked feature of *quality*. However certain may be the *excess* of fibrin, its qualitative deviation becomes more and more distinctly pronounced in proportion as in the series of fibrin-crases the forms recede from the characters of *true* fibrin. This, with the exception of a few hints thrown out by Andral, has been hitherto ignored. In this qualitative anomaly, however, the varieties of the fibrin-crases are founded. Each may be, and very often is, a hyperinosis, at the same time. Still the qualitative anomaly is the essential point; and it may, in a *hypinotic* crisis—that is, in poverty of fibrin—cling to a minimum of fibrin, and with it manifest at once that peculiar tendency of fibrin-crases to localization, and a marked peculiarity in the product.

These different fibrin-crases are, as in the sequel their special delineation will show, manifested by certain anomalies of appearance and structure. They are distinguished in common by the proneness

of their fibrin to coagulate, and by its deposition, more or less pure, within the vascular system, from the heart to the capillaries downwards. They are, moreover, marked by their localization in inflammations which are wont to affect very vascular organs, such as the lungs, mucous and serous membranes, and areolar tissue.

The fibrin-crises including pyaemia, tend more particularly to prove that all those changes which the plasma undergoes in local dyscrasial inflammation, and its products or exsudates, take place within the general circulation and by virtue of its own intrinsic relations, not through any local reciprocation between the blood and the textures inflamed.

The fibrin-crises constitute, generally, the so-called *phlogistic blood-admixture*, against which, conformably with the view of a quantitative exaltation of the vital process, the lancet has ever been opposed. Yet amongst the processes in question, far-sighted pathologists have always discriminated some in which much bleeding appeared not only needless but even mischievous; we refer more particularly to the croupous processes. That in these, a qualitative deviation in the constitution of the fibrin plays the part chiefly deserving of attention, is proved not only by the more obvious anomalies of aspect and of structure before alluded to, but also by —

1. The proneness of these crises to become localized, even where the amount of anomalously constituted fibrin in the blood is very inconsiderable; as, for instance, in the secondary croupous crises emerging out of the typhus-crisis; in the tuberculous crisis, in which the last particle of fibrin is expended in the deposition (localization) of tubercle.

2. The reaction of many congenerous exsudates upon their parent textures,—this reaction consisting in softening and corrosion.

3. The wasting attendant upon hyperinosis, or the predominance of fibrin, that element of the blood commonly held in an especial manner to preside over general nutrition. Here the alienation of functional activity can only be interpreted as qualitative.

We have already adverted to the localization of the fibrin-crises. In relation to this, it is a question equally interesting and opportune, *whether the crises regarded as hyperinoses, in inflammations, be determined by the latter, or constitute the primary and fundamental disease?* The view received in France, tends to demonstrate the dependence of the crisis upon the local inflammation; in other

words, the symptomatic character of the crasis. With the setting in of the inflammation and its increase, the amount of the fibrin is supposed to become augmented.

We are fully convinced that an inflammation obviously called forth by external causes may, by the abduction of endogenous, and the resorption of exsuded products, give rise to a corresponding crasis, which will become augmented in proportion as the inflammation increases in intensity and extent. On the other hand, we believe that spontaneous stases are localizations of a crasis, and stand to it in a dependent—a conditional—relation. This opinion is based upon the following facts:

1. Every crasis (by no means the fibrinous crases alone, to which, as the so-called phlogistic, we might be disposed to concede this prerogative) is capable of localizing itself in the shape of inflammation; take, for example, the typhous and the exanthematous crases. The objection that inflammations, and especially pneumoniae, arise during the progress of typhus, is met by the fact that those inflammations with the character of a fibrin-crisis are based upon a fibrino-croupous crasis—in other words, that they are the localization of a fibrino-croupous crasis into which the typhus has become converted. Genuine typhous pneumonia (pneumo-typhus) does not develop a fibrin-crisis, any more than does typhous inflammation of the intestinal follicles or of the mesenteric glands.

2. An objection of considerable weight against the opinion promulgated by Andral, is furnished by pneumonia, the very process commonly concurrent with the most marked hyperinosis. We believe that ordinary pneumonia (with fibrinous product) is for the most part, the localization, of a pre-existent, that is, precursorily developed crasis, a crasis characterised by an incontestable relation to the lungs, and to the mucous membrane of the air-passages. Such a view does away with the paradox that inflammation of the lungs, a disease which, in its intense form, attacks and disables large sections of the lung, should uphold so enormous a development of fibrin, whilst other lung diseases lead to crases of the very opposite kind—in a word, to venosity (Hypinosis, Albuminosis, Cyanosis).

3. Lastly, the argument derives force from the general disturbance which always precedes a localization, seeming to bear witness to an alteration in the crasis. And to this may be added, the nature of

the causal influences, which appear to be rather general than local. We may instance epidemics, climate, weather, &c.

Fibrin-crises become, for the most part, primitively developed under the conditions of a free respiratory function. Of this fact, striking examples offer in the tuberculoses, and the setting in of croupous and of tuberculous processes after child-birth, that is to say, after the release of the thoracic spaces and of the lungs, resulting from deliverance of the womb.

Certain fibrin-crises are *primary*, and distinguished by their localization upon the mucous membrane of the air-passages, (Laryngeal, tracheal, bronchial, pulmonary croup) upon serous and synovial membranes, and in large accumulations of areolar tissue. Others are *secondary*, that is, the consequence or the conversion of other crises, for example, of the typhus-, of the exanthema-, of the cholera-crisis. In these, a *qualitative* anomaly of the fibrin predominates, as shown by this, that, even where but an inconsiderable amount of fibrin becomes developed, localization takes place, and this of an unwonted kind, as, for instance, upon the mucous membrane of the intestinal tract, of the urinary passages, of the gall-ducts, &c. Others, again, are *primitive*, *spontaneous*, or even *consecutive affections* of the blood determined by infection with analogous substances. They are often epidemical.

Above all other crises, the fibrin-crises, like the fibrin-exsudates, are never thoroughly pure. Every portion of morbid fibrin has, associated with it, another portion of less diseased, or even of normal fibrin.

The products of the localized fibrin-crises (endogenous coagulation, and especially exsudates engendered by inflammatory stasis) are partly organizable (designed for regeneration, or expended in hypertrophy), partly unorganizable, liquefying, corrosive, purulent, or ichorous. These exsudates correspond so completely with the nature of the coexistent fibrin-coagula within the vascular system, that the character of the one may with safety be inferred from an acquaintance with the other.

It is interesting that coagulations in the left heart, that is out of arterial blood, are not alone more decidedly compact, but also more frequent than those out of venous blood. As evidence of this we may cite the incomparably more frequent globular vegetations in the arterial chambers of the heart.

As yet, chemical analysis has contented itself with demonstrat-

ing the quantitative excess of fibrin in the blood. According to our own researches, however, investigations are urgently requisite which have for their principal aim to determine the qualitative impairment of the fibrin. An augmentation of the fibrin is always coupled with a diminution in the amount of blood-globules, and, as chemists maintain, at the same time with an increase in the proportion of fat present in the blood. This certainly, however, does not apply to every fibrin-crisis.

Fibrin-crises attended with great exsudation, frequently bequeath, as consequent upon the exhaustion of fibrin, a condition of hypinosis (defibrination), and of hydraemia. They eventually prove fatal from this source, if the patient have escaped the deadly influence of paralysis of the organ of localization, or of spontaneous coagulation in important sections of the vascular system; for instance, in the ramifications of the pulmonary artery. The highest grades of dyscrasial fibrin-constitution, finally degenerate into sepsis of the fibrin, and, indirectly, of the entire blood-mass.

The crisis may also terminate in restoration of the normal crasis, through conversion of the morbid excess of fibrin into nitrogenous substances, eliminated with the urine and perspiration. The fibrin thus becomes largely converted into excrementitious matter.

* * *

THE CROUPOUS CRISIS (PIORRY'S HAEMITIS).

The croupous crisis occurs under several forms, which at the same time represent various gradations of disease of the fibrin. Amongst them we find, on the one side, the most marked hyperinosis; on the other, a scanty proportion of fibrin, but that deeply affected in quality. This is manifested first by its augmented coagulability, by a greatly increased tendency to deposition in the shape of intra-vascular coagulation (in the capillaries, as capillary phlebitis), and, lastly, by acute processes of exsudation.

Both the intravascular coagula and the exsudates are distinguished by their indisposition to become organized, by their early liquefaction, and very often by their corroding, solvent effect upon the textures. Both are opaque, yellow, or of a greenish yellow, and contain fat. The adhesive property gradually diminishes.

To the latter, namely, the exsudates, must be reckoned some, exhausting by their volume and abundance, others inferior in

quantity, but indicating, by their tendency to liquefy and by their reaction upon the textures, the deep impairment of the fibrin.

They are often idiopathic, but more frequently consecutive crases, emerging out of others,—the typhous, the exanthematous, &c. In the former case they are marked hyperinoses; in the latter case they are determined by inflammation, and the infection of the blood with congenial products. They constitute the so-called haemites of Piorry.

In their processes of exsudation, they evince a preference for the mucous membranes, especially of the respiratory and of the digestive tracts, as also for the serous and synovial membranes.

* * *

THE TUBERCLE-CRISIS

Although there are, no doubt, tubercloses purely local, a tuberculosis extending through several organs, or even through one entire organ, is invariably the offspring of a tuberculous dyscrasis.

The latter is for the most part developed out of a *fibrin-crisis*. In the dead subject, a hyperinosis of the blood may not be ostensible.—Nay! owing to the frequent and voluminous processes of exsudation attendant upon the course of a tuberculosis, a poverty in fibrin is perhaps more likely to reveal itself after death. Excess of fibrin has, however, been demonstrated, in such cases, by the chemical examination of blood withdrawn during life, and it may also be inferred from the extent of the tuberculous deposition. Still the hyperinosis is far from being adequate to account for the disease. It is the qualitative anomalies of the fibrin that must determine its tuberculous nature,—anomalies of quite a peculiar kind, which, as we shall see, may modify every one of the fibrin-crises referred to into the tuberculous.

The gray tubercle answers to the character of the *simple fibrin-crisis* (See “Gray Tubercle”).

The opaque, yellow, lardo-caseous tubercle, marked by its proneness to undergo softening, answers to the character of the *croupous-crisis* (See “Yellow Tubercle”).

We have remarked of the products of the fibrin-crises that they are seldom unalloyed. The same observation applies to the products of the tuberculous-crisis. The products of the one always occur intermingled with elements of the other; and tuberculous products

may even include more or less of organizable elements which form into textures in the ordinary way.

Again, the transitions of the individual tubercle-crisis from one to another are obviously brought about step by step. The croupous tubercle appears but rarely as the primitive tubercle. It is generally based upon a pre-existent gray tubercle, and the croupous tubercle appears as an aggravation of the simple form.

In the fibrin-crises a minimum of fibrin suffices for the groundwork of a qualitative impairment, and this in its amplest sense applies to tubercle. The smallest proportion of fibrin present in the blood takes of the taint and becomes expended, up to the point of complete defibrination, in the deposition of tubercle.

Still these said crises by no means serve to throw much light upon the nature of tuberculosis. They must needs involve a peculiar—a tuberculous—modification, the existence of which is indeed proved by the tuberculization of extra-vascular fibrin in hemorrhage, and also of intra-vascular fibrin-coagula. *In this modification must be rooted:*

(a). The surpassing proneness of the fibrin to deposition, so frequently brought about in quite an insensible manner.

(b). The assumption by the deposited fibrin of the particular form of tubercle. The granulation of tuberculous products of inflammation upon serous membranes might indeed be ascribed to a separation of the tuberculous portion, due to its great coagulability. Still the very localization of the tubercle-crisis, in such minute and sharply-defined areas that little granule-shaped exsudates are the result, constitutes a peculiarity—a remarkable peculiarity, seeing that the same form of separation—the same form of tuberculization—attaches to the fibrin of hemorrhage and to endogenous vascular coagula.

(c). The fact that blastemata resulting from the tuberculous fibrin-crises do not undergo the metamorphoses—proper to the pure fibrin exsudates—of textural formation on the one side, and of rapid purulent liquefaction on the other; but throw off their exsudate-water in the act of firm coagulation, and tarry for a while in this crude state of consolidation. This respite is of various duration, but at all events exceeds both that proper to textural conversion, and that common to disintegration, in corresponding, *purely* fibrous exsudates.

As the most marked and obvious phenomena connected with

tubercle must be specified its high grade of coagulability, and its surpassing proneness to deposition,—to the localization of its crasis. In these are without doubt centred the peculiarities of the fibrin-crases in their tuberculous modifications.

If, in relation to these peculiarities of tuberculous fibrin, we take into account:

(a). The consummate coagulability of arterial fibrin generally;

(b). Its supreme sensitiveness towards heterogeneous substances, such as inflammatory products, whose reception, for example, in arteritis, occasions locally so rapid an obstructing coagulation of the blood-column, as to obviate any infection of the general blood-mass from that point. (See “arteritis,” vol. iv.)

(c). The ready deposition of fibrin out of arterial blood, as stratiform coagula upon the inner arterial surface, a disease, in its consummate form, peculiar to arteries;

(d). The very common localization both of the fibrin-crases, whether spontaneous or determined by infection, in the shape of exsudate, or of endogenous coagulation within the capillaries of the arterialising organs (the lungs), and again the still more marked relation of the tuberculous-crisis to these viscera.

(e). On the one side, the pre-eminent development of the pulmonary organ, as predisposing to the fibrin-crases in general, and to their tuberculous modification in particular;

(f). On the other side, the pre-eminent immunity afforded by exquisite vascosity and cyanosis, against fibrin-crases, more especially the higher (croupous) grades, and most particularly against the tuberculous-crisis,—taking, we say, all these circumstances duly into account, we are forced on to the momentous conclusion that *arteriality, that is, the arterial development, of the fibrin, pre-eminently constitutes the cardinal character of tuberculosis.*

The qualitative impairment of the blood-fibrin here again, as in the fibrin-crisis of a higher grade, serves to explain summarily the fact, that in individuals with blood impoverished in fibrin,—or even generally impoverished,—tubercle continues to become deposited. It has been elsewhere affirmed, and it is worthy of repetition here, that in such cases *every atom of tuberculo-dyscrasial fibrin becomes expended in the formation of tubercle.* This view clears up the seeming inconsistency of affirming tubercle to be rooted in a fibrin-crisis, whilst florid tuberculosis is found to be associated

with a deficiency in fibrin. It is the prevailing notion of mere *excess* in fibrin that we would impugn.

The tuberculous-crisis itself may, by various chances, become modified through a combination with other dyscrasial constitutions of the fluids, giving rise, at least in part, to the several known varieties of tubercle.

The tuberculous-crisis is commonly protopathic. Frequently enough, however, it results from other crases. The conversion of typhous, of exanthematous hypinosis to the tuberculo-croupous-crisis is frequent, and of the greatest scientific and practical interest.

The tuberculous-crisis results, through exhaustion of the fibrin, in a defibrinated condition of the blood,—in albuminosis. And, again, the albumen—upon which the wasted fibrin may be supposed to have ingrafted its own morbid character—may take up the work of exsudation in the shape of acute, albuminous tubercle, of lardaceous infiltration of the liver, spleen, and kidneys,—of genuine albuminuria;—hydraemia and anaemia being the final issue.

The corpses of the tuberculous, responding to the long-continued and copious expenditures of protein substances upon tubercle, present general emaciation, with consumption of the fat and of the bone-medulla,—flabbiness, wasting, pallor of the muscles; fatty infiltration of the liver, spleen, and kidneys; and lastly, oedema and dropsy. The blood, with a few scanty fibrinous coagula, is fluid, adhesive, dark-red; or else, with the exception of very inconsiderable soft coagula, it is thin, watery, of a pale-red, resembling water in which flesh has been steeped. Wherever abundant fibrin-coagula are met with, they present the characters proper to the fibrin crisis, often in conjunction with tubercle-like concretions, which in their elementary composition fully harmonise with the tubercle of exsudation, that is, the tubercle of the textures.

PYAEMIA. PUS-BLOOD

This crisis, again represents a *local pus-production*, and also a *spontaneous primitive pyaemia* of the entire blood-mass.

In pyaemia it is necessary to distinguish two different grades or stages, in order to bring the various facts into mutual concord, and to avoid contradiction in the characteristic given of this blood disease. Those facts are, on the one side, the coagulation and deposition; on the other side, destruction, of the fibrin. The latter may become developed as a higher grade,—as a consecutive stage,

out of the former. The higher grade may, however, set in at once, as a protopathic-crisis, without being preceded by the first or lesser grade.

In the lesser grade the blood-crisis is characterised by quantitative excess in the production of fibrin (hyperinosis), which is at the same time qualitatively impaired. It is marked by a high degree of coagulability and of proneness to separation from the blood-mass,—manifesting itself as croupous, liquefying fibrin. These main features of the crisis illustrate the following appearances.

The fibrin-coagula endogenous to the vascular system, are remarkable for their opacity, for their varying hues of dull white, of yellowish green, of reddish gray (from inclosed blood). They are soft, and yet tough—their contained serum being of a whey-like turbidness. A closer inspection shows them to consist of a glebous basement, with the rudiments of fibrils, and about these a vast quantity of fine point-molecule. There are, besides these, nuclei, and nucleated cells the nuclei of which appear to resemble in various degrees, up to complete dissilience, pus-nuclei. Sometimes they exhibit little tubercle-like congeries, which consist of collected elements of pus. Having originated during life, they soften, with liquefaction of the said basement, to a fluid which assimilates to pus proportionately to the amount of pus-cells included in the clot.

This crisis, in its most developed grade, possesses the peculiarity of localizing itself in many areae in rapid succession. Along with highly acute inflammation with purulent effusion upon mucous membranes, upon serous membranes, and in areolar tissue, these areae appear in every variety of organ and of texture, and are generally distinguished for their small circumference and their sharp definition. They form suddenly in the textures as red obstructions, which almost as speedily deliquesce with sloughing and ulcerous fusion of the involved textures to a yellow or greenish-yellow pus. Wherefore,—as also owing to the lack of evidence of antecedent inflammation,—they have received the name of pus deposits or depots; of pus metastases. We have already described the attendant anatomical process, and seen that these acts (like others brought about under the fibrin-crisis) consist essentially in a spontaneous coagulation of the blood-fibrin in the capillaries, and its immediate liquefaction, with ulcerous corrosion of the blood-vessel membranes and of the contiguous textures; to which process, inflammation with similar products, as the encompassing inflammatory areola, super-

venes. Coagula of the same nature form on the great vessels and, in the shape of purulent vegetations, also in the heart.

The blood appears, along with the endogenous fibrin-coagula described, as a tenacious fluid of a russet hue. It is seen spread out in a thin layer, and mingled with little soft particles, which turn out to be aggregates of pus-nuclei and pus-cells, along with blood-corpuscles, in a transparent clot.

The dead body, owing to the voluminous separation of coagula, presents extensive livid patches verging upon russet coloration; hypostases; textural redness of imbibition; lack of rigor; flabby muscles; friable, doughy, collapsed parenchymata.

The higher grades of the pus-crisis consist in destruction of the fibrin; attenuation and discoloration of the blood; septic decomposition of the circulating fluid, of a nature corresponding to the rapid ulcerous and gangrenous up-breaking of textures in the local processes.

The more intense is the aggravation of the crisis, the less do we encounter the aforesaid depots. It is only in the transition to the higher grades that we meet with them, obviously breaking up, along with the involved textures, to a dingy brown, coffee-ground, or olive-coloured, collapsing, fetid pulp. The same metamorphosis affects both the exsudates and their parent strata. In the *highest grade* extensive passive stases affect the decomposed blood, producing necrosis with dark and hemorrhagic imbibition of the textures.

The dead bodies of persons who have died of pyaemia at this stage, manifest, apart from the external and internal local processes—due, it may be, to an earlier phase—long retention of animal warmth, little and evanescent rigor, flabby and pale muscle, more especially discoloration and lacerability of the heart, and rapid decomposition with extensive, brownish death-patches. The parenchymata are lax, easily torn, serum-drenched, pale, or of a spurious redness in various shades, owing to hyperaemia and imbibition of dissolved blood-pigment. The lungs are the especial seat of hypostatic congestion, with a dark coloration verging upon cherry-red or upon brown. The blood in the heart and vascular trunks contains scanty, colloid-like, cruor-holding, red, and, sometimes greenish-red, coagula, and is itself of a cherry red, adhesive, or else attenuate, brownish; having stained the blood-vessel membranes and the endocardium with its colouring matter. Pyaemia is not unfrequently

primitive (protopathic—or deuteropathic, that is arising out of other anomalous crases—for example, the typhous, the exanthematous). More commonly, however, it is *consecutive* to the reception of pus into the blood, or else to infection, brought about in the various ways, fully detailed at page 258 of the present volume.

This applies to both grades of pyaemia of which it has been stated that the second also occurs independently, determined through infection of the blood by a foul pus decomposed through stagnation. To this category belongs, amongst others, the infection proceeding from the poisoning of wounds with pus out of the dead body. Darcet brought forth the disease by injecting corrupt pus-plasma, a disease into which, as a purulent sepsis or necrosis of the blood, the minor grades of pyaemia with hyperinosis become spontaneously exalted, probably owing to the pus in the blood becoming oxydized in the respiratory process.

The circumstance that pus secreted bodily into the canal of a blood-vessel, commonly produces a more intense infection than pus-plasma probably received into the blood by resorption, might lead one to conclude that it is to the pus-cell that pyaemia is attributable. Nevertheless, apart from the incomparably larger proportion of pus received into the blood in the former case than in the latter, the occurrence of primitive pyaemia precludes our adjudicating in favour of either the pus-cell or pus-plasma as the causal agent. Far more depends, without any doubt, upon the quality of the pus; and it is certain that a large proportion of bland pus taken up into the circulation proves far less mischievous than an incomparably smaller quantity of purulent ichor. That the pus-cell taken up into the blood, or even that other cell formations of larger size—certain cancer-cells, for example—should, by obstructing the capillaries, give rise mechanically to so-called depôts (metastases) will scarcely be credited at the present day.

Pyaemia generally proves fatal, as purulent poisoning: considerable grades of it, however, are susceptible of cure. This occurs, without doubt, partly through a conversion of the pus, analogous to the metamorphosis of fibrin—partly through elimination of the pus in exsudatory processes, especially upon extensive mucous membranes, like that of the intestinal tract. The elimination of pus through processes of secretion, for instance, its passage through the kidneys, with the concurrent disappearance of pus-deposits, is a phenomenon much talked of. The pus-cell both in the urine and in

exsudates is incapable of becoming reabsorbed, and equally so of passing out of the blood-vessels, either into the uriniferous tubules or at any other part. It follows, therefore, that pus-cells, either in the urine or in an exsudate, must be a new creation out of effused plasma.

HYPERAEMIA¹

It is to be understood that we have to deal only with local hyperaemia—congestion, so called.

It consists in an excessive amount of blood in the capillaries of an organ; that is, in an injected condition of this latter, exceeding what experience has shown to be its average. This is not possible without dilatation of the vessels, nor can we admit the existence of congestion with coarctation of the vessels, and a *consequent* accelerated passage of the blood through them, which some have designated as active congestion.

A simple comprehensive view of the development of hyperaemia is not feasible, the conditions not being always the same. It will, perhaps, suffice to distinguish between *active*, *passive*, and *mechanical* hyperaemia. We shall here, however, not consider these individually—more especially, the two former—further than may be requisite for the establishment of a principle. Their closer investigation will be more appropriate under the head of inflammation.

1. *Active hyperaemia* is the result of external or internal stimuli acting immediately upon an organ, or reflected to it from other organs,—irritating the sensitive nerves, and thereby causing antagonistic palsy of the *nervi vasorum*, or, (according to another theory,) evoking an increased afflux of blood, a preternatural affinity of the parenchyma for the blood.

To this category belong, for the most part, those hyperaemiae, dependent upon external or internal causes, which precede inflammations; most of those habitual, constitutional hyperaemiae, rooted directly in the nervous system or in the blood; again, those hyperaemiae occasioned by augmented activity, by over-wrought function, or concurrent with excited conditions of the organs.

2. *Passive Congestion* depends upon direct palsy of the *nervi vasorum*, wherewith is commonly associated a depressed energy

¹ Translation by William Edward Swaine, 1854.

in the remainder of the nervous system. The palsy may originate in the centres, or it may be peripheral. It is often determined by dyscrasis, and especially by the higher degrees of decomposition of the blood.

To this class must be referred those hyperaemiae, introductory to so-called asthenic inflammations, in organs exhausted by excess of functional activity, enfeebled by hyperaemia and inflammation, or paralysed; as also in those hypostatic hyperaemiae of the lungs, of the abdominal and pelvic organs, of the common integuments, which are developed under diminished impulse from the heart, in dependent parts of the body, during the progress of various adynamiae and marasmi.

3. Mechanical hyperaemiae, namely—

(a) Hyperaemiae arising from palpable mechanical impediments to the return of the blood through the veins, or to the ultimate disgoring of the venous trunks into the heart. The extension of the hyperaemia varies with the locality of the impediment. It affects single organs and sections of organs; for example, a portion of intestine strangulated, invaginated through tension and compression of its blood-vessels. Or it may have a more comprehensive range in impermeability of the liver, of the lungs, in stenosis (coarctation) of the heart's valves. The hyperaemiae occasioned by spontaneous coagulation within the capillaries, by various elements obstructive of these vessels, as pus-corpuscle, cancer-cell, injected mercury globule, are commonly referred to the same head.

(b) Hyperaemiae *ex vacuo*, as they occur in atrophy of the brain within the unyielding skull, or in the gravid uterus, after rapid delivery, often to the extent of producing hemorrhage; hyperaemiae due to the eccentrical rarifying atrophy of organs.

The hyperaemia is either of a more or less *transitory* or of an *abiding* nature, of which latter kind mechanical hyperaemiae, from heart disease or from induration of the liver, present the most frequent and the most marked examples.

The sequelae of hyperaemiae are multiplex, varying with the duration, the repetition, the degree, of the congestion. Much likewise depends upon the character of the affected organ, the congestion being significant in proportion to the general importance of such organs, and to the vulnerability of its texture. Organs are prone to

congestion proportionately to their vascularity and to the degree of their functional activity. Under particular circumstances of life, of occupation, of civilization, certain organs, such as the brain and its membranes, and the lungs, are hardly ever entirely free from congestion. Hyperaemia affects morbid growths equally with normal formations.

Intense congestion suddenly developed in organs essential to life, (the brain or lungs,) may prove fatal directly, as so termed *vascular* apoplexy, or through the sudden effusion of blood serum into the textures—acute edema.

High degrees of congestion occasion laceration of capillaries and parenchymatous hemorrhage (apoplexy with bloody extravasation) in the brain, the lungs, and other organs.

The same causes lead, by an overloading of the blood-vessels, to absolute palsy of the blood-vessels, to stasis, inflammation, and gangrene.

Moderate but habitual or repeated congestion gradually engenders edema and the dropsy of serous cavities—*genuine dropsy*, increased exudation of blood plasma, preternatural nutrition of the textures—hypertrophy, augmented secretion.

In this relation, abiding mechanical hyperaemiae, from heart disease, are worthy of especial notice, with their unfailing consequences, hypertrophy of the glandular abdominal viscera; preternatural secretion of the intestinal and bronchial mucous membrane; excessive, saturated secretion of bile.

Hyperaemiae create and bequeath permanent dilatation and elongation with coil-like or serpentine deflection—properly termed varicosity—of the blood-vessels, as more particularly exemplified in the less resilient veins.

Hyperaemiae frequently occasion and obviously accompany the development of various heterologous growths. Finally, in some organs, a proportion of blood pigment, effused with the plasma, constitutes the basis of rust-coloured, slate gray, bluish-black coloration, as in the lungs or on the intestinal mucous membrane.

Organs attached by a high degree of hyperaemia present different shades of dark red, become swollen, loosened in texture, and consequently friable, lacerable. In organs of a porous, spongy texture, the swelling seems due to a bloated condition of the tissue itself.

ANOMALIES AND DISEASES OF THE HEART¹

We will now proceed to consider the Anomalies and Diseases of the Heart, including those of the Valves; but wherever it may prove of great practical interest to acquire a more correct knowledge, both generally and specially, of the anomalies of the valves treated of in the different sections, we purpose, at the close of each, entering more fully into the details of the subject.

We will, moreover, consider simultaneously all original malformations of the heart and of the vascular trunks, not only on account of the natural connection existing between them, but also with view of furnishing the premises necessary for the better comprehension of the appendix on cyanosis, which is subjoined to our remarks on the anomalies of the heart. In order, as far as possible, to facilitate a reference to the most important original malformations, we have arranged the following sections somewhat differently from those by which they are preceded.

DEFICIENCY AND EXCESS OF FORMATION

Absence of the Heart—Acardia—is generally of very rare occurrence, but is a common phenomenon in Acephalia (absence of the brain), especially where there is an absence of the upper half of the trunk. It has only been observed in very rare cases when the nervous system is perfect and complete.

In the consideration of deficiency of the heart we include a series of deficient formations (arrested developments) which may be arranged as follows:

a. The lowest type of formation is that in which a single cavity without valves represents a ventricle in which a dilatation of the vena cava appears as the rudiment of an auricle. The latter is membranous, and the former has only thin muscular walls and weak trabeculae.

b. Next we have a heart consisting of one ventricle and one auricle, with simple vascular trunks, into the former of which opens an aorta, and into the latter a vena cava. In many cases this formation approximates to the succeeding one in which there are two auricles with a single ventricle.

c. In this form there is a single ventricle and one auricle which is either partially or wholly divided into two cavities by means of

¹ Translated by George E. Day, 1852.

a partition wall. The arterial and venous trunks may be either single or separated.

d. Here a capacious ventricle presents the rudiment of a septum ventriculorum, which becomes so far developed as finally to exhibit only an aperture which is usually situated at its upper extremity. The most common anomaly of the vascular system combined with this form is the origin of the aorta from both ventricles, and the displacement of the pulmonary artery. The foramen ovale in the partition between the auricles remains open. In other cases the septum is perfect, but so situated as considerably to diminish the size of one or other of the ventricles, interfering with its valvular apparatus, and giving the auriculo-ventricular opening a very contracted and even closed appearance,—a condition of things that involves the patency of the foramen ovale and of the ductus arteriosus.

e. Here we have a form of the heart in which the partition between the auricles is defective, although there is a perfect separation of the ventricles. The degree and form of this defective structure are very variable. The septum is sometimes entirely absent, its line of direction being simply indicated by several soft membranous filaments which pass from the posterior to the anterior wall of the common cavity of the auricles. In other cases the rudiment of a septum atriorum develops itself in the form of a crescentic band, either from the arch of the auricle, or below from the septum ventriculorum. The wide aperture of communication between the two auricles is round or oval, and has its major axis inclined from before backwards. In other cases, the rudimentary structure is sometimes so far developed round the septum that this deficiency is often represented by a smaller and obtuse triangular aperture; and in other cases, again, the septum seems so far developed from above that it may easily contain a foramen ovale. There are, in this case, two apertures in the partition between the auricles, the former, which depends on defective formation, is not closed, and the latter (the foramen ovale) remains open.

Cases of this nature are generally characterised by a congenital contraction or insufficiency of the aorta, by extraordinary dilatation of the pulmonary artery, and by eccentric hypertrophy of the right side of the heart.

f. In this form the foetal passages,—the foramen ovale, and the ductus arteriosus,—remain open. The degree of the patency of the

foramen ovale varies considerably, its valve being very nearly or entirely absent in some cases, but more commonly the upper third or fourth portion of it is wanting, and most frequently of all there is a mere deficiency of attachment at the upper part of the isthmus, by which means a fissure rather than a foramen is formed, which communicates in a very oblique direction from below and behind upwards and forwards from the right into the left auricle. This foetal condition is sometimes persistent to a greater or less degree, and consists in this—that under a marginal projecting rudiment of the Eustachian valve, which penetrates into the anterior columna isthmi fossae ovalis, there is a communication with this fissure-like aperture, or with the still patent foramen ovale. The opening at the upper boundary of the isthmus is either formed as a simple fissure, or consists of several small and roundish apertures. The cause of the patency of the foramen ovale frequently depends on the different malformations of the heart already enumerated, and on the different anomalies of the arterial vascular trunks and of the ductus arteriosus, which still remain to be noticed. The patency of the foramen ovale most frequently corresponds with an incidental arrest of development. In some cases it is associated with smallness of the heart, and retraction of the apex (the foetal condition). It is of very frequent occurrence in its lesser degrees.

The patency of the ductus arteriosus will be more fully noticed in a future page.

The following are the most important of these *Anomalies of the Vascular Trunks*:

1. Those affecting the *Aorta*.

a. There may be a single arterial trunk, which may be regarded as an aorta sending off branches from different points to the lungs.

b. The aorta may be a vessel from which only the branches of the upper half of the body (and not all of these) are given off, whilst the pulmonary artery, through the ductus arteriosus, constitutes the descending aorta.

c. There may be different degrees of obstruction of the aorta, which may be either very narrow or quite closed from its origin to its point of junction with the ductus arteriosus, in which case it is supplied by the latter with blood from the pulmonary artery. The whole arterial trunk with its ramifications,—in short the whole arterial system,—is in this case frequently disproportionally narrow.

d. The aorta may originate from both ventricles, owing to a de-

ficiency in the partition-wall between them, in which case it is deflected somewhat to the right. The pulmonary artery is, in this case, either normal, or, as is frequently observed, it is obstructed, narrow, and even closed. The ductus arteriosus, if it be present, then remains open, and carries the aortic blood to the pulmonary artery.

2. Those affecting the *Pulmonary Artery*.

a. The trunk of the pulmonary artery is not only absent where the lungs are wanting, but even where these are present and are furnished with vessels from the aorta.

b. Obstruction of the pulmonary artery, which may be either too narrow or wholly closed, in which case the blood is conveyed to it through the ductus arteriosus from the aorta. This occurs when the right ventricle is imperfect, when the conus arteriosus ends in a *cul de sac*, and very commonly when the aorta originates from both ventricles.

To the above we may add—

3. Anomalies of the *Ductus Arteriosus*.

a. It is sometimes wholly absent.

b. Besides sending several vessels to the head and upper extremities, as do also the branches of the pulmonary artery, it supplies the aorta descendens, or rather merges into it. In this case the aorta diminishes in calibre after giving off its branches, and merges as a thin vessel into the large ductus arteriosus after the latter has been curved into an aorta descendens. (Kilian.) This anomaly occurs either separately and independently, or conjointly with other anomalies of the vascular trunks and of the heart.

c. The most common anomaly is a defective involution of the ductus arteriosus after birth; it either remains open or even in some cases experiences a dilatation. It is, however, much more rarely open than the foramen ovale, whose patency is in general a necessary consequence of different anomalies of the heart and vascular trunks, although even here many exceptions present themselves. On the one hand, it may remain open without any palpable anomaly of the heart and vascular trunks, and on the other it may be contracted, and even closed, where such anomalies exist.

Its involution may be hindered either by the pulmonary artery or the aorta; thus it may either be entirely patent, or may exist as a mere opening closed in the direction of the pulmonary artery, but patent towards the aorta. To this class belong those cases in adults, where the ductus arteriosus forms a sac-like appendage to the

aorta, and where the obliterated ostium arteriae pulmonalis has the appearance of having been re-opened by violence.

When the ductus arteriosus remains patent, many causes combine to keep the foramen ovale open.

Finally, we also observe a deficiency in the formation of the *valves*. The auriculo-ventricular valves present various obstructions and malformations, generally in connection with a simultaneous malformation of the corresponding ventricle, or associated with a contraction or occlusion of the opening, and principally on the right side. In reference to the arterial valves those of the pulmonary artery are occasionally absent, while malformation and closure of the latter artery, a blind termination of the conus arteriosus, and an abnormal condition of the whole of the right ventricle, are simultaneously present. These valves not unfrequently assume an abnormally inflated annular form, and in some cases only two instead of three valves are observed in the pulmonary artery or in the aorta.

The valve of the foramen ovale is either wholly absent or, as we have already remarked, is imperfect in various ways. In rare cases the Eustachian valve has been found wanting. Its defective involution after birth is interesting, inasmuch as it gives rise to the imperfect closure of the foramen ovale. The Thebesian valve has been found wanting in a few cases.

Malformations *per excessum* affect the heart and vascular trunks in various modes and degrees, and may be referred either to a duplication, or to an arrest of development.

To the *former* belong—

Complete duplication of the heart, or the occurrence of two separate hearts in two distinct pericardia, or in one common pericardium, which is not unfrequent in double monsters, especially where there is duplication of the upper half of the body, while the observations on record regarding a double heart in a single body, are very few in number, and of doubtful character.

Duplication of one or more portions of the heart, or the presence of supernumerary, more or less perfectly separated cavities from which numerous vessels proceed, is of very rare occurrence when there is only a single body. We observe, however, occasionally, in normally formed individuals, a rudimentary partition projecting, in the form of a band or amorphous mass of muscle, into one of the cavities of the heart.

A large heart, from which proceed double vessels, is found in double monsters.

To the *latter* belong—

The persistence of a double aorta ascendens, a cleft condition of that vessel, the persistence of a ductus arteriosus on the right side (Breschet), and the duplication of the upper as well as the lower vena cava.

The valves also occasionally exhibit an excess of formation; we have either an increase of the apices of the auriculo-ventricular valve of the right side, or supernumerary valves, or a multiplication of their apices, with perforation of the ventricular partition; or there may be four semilunar valves in the aorta or the pulmonary artery, or duplication of the Thebesian valve, &c.

THOMAS ADDISON

(1793-1860)

ANOTHER OF the "great men at Guy's" whose name has been preserved in firm linkage with a morbid state, is THOMAS ADDISON, who first brought to light the association of constitutional symptoms with disease of the suprarenal glands. His early thoughts on this subject were communicated to the South London Medical Society in 1849. Six years later he published his matured views with the report of eleven cases. As he brings out in this paper, he accidentally "stumbled" on the suprarenal syndrome while trying to solve the etiology of "idiopathic anemia," now better known as "pernicious anemia" and occasionally called "Addison's anemia" in tribute to the first discoverer. The name "Addison's disease" was given to the symptom complex in which the suprarenals are concerned, by the French physician Armand Trousseau when the importance of the "endocrine" glands in physiology was better understood. On account of its length a portion only of Addison's report "On the Constitutional and Local Effects of Disease of the Suprarenal Capsules" (1855) is given here. It is interesting to note that while Addison's disease is usually the result of tuberculosis of the suprarenal glands and only rarely some other disease, as malignant tumor or atrophy of undetermined cause, Addison's eleven cases included some of the rareties.

ON THE CONSTITUTIONAL AND LOCAL EFFECTS OF DISEASE OF THE SUPRA-RENAL CAPSULES

It will hardly be disputed that at the present moment the functions of the supra-renal capsules, and the influence they exercise in the general economy, are almost or altogether unknown. The large supply of blood, which they receive from three separate sources; their numerous nerves, derived immediately from the semilunar ganglia and solar plexus; their early development in the foetus; their unimpaired integrity to the latest period of life; and their peculiar gland-like structure—all point to the performance of some important office: nevertheless, beyond an ill-defined impression, founded on a consideration of their ultimate organization, that, in common with the spleen, thymus, and thyroid body, they

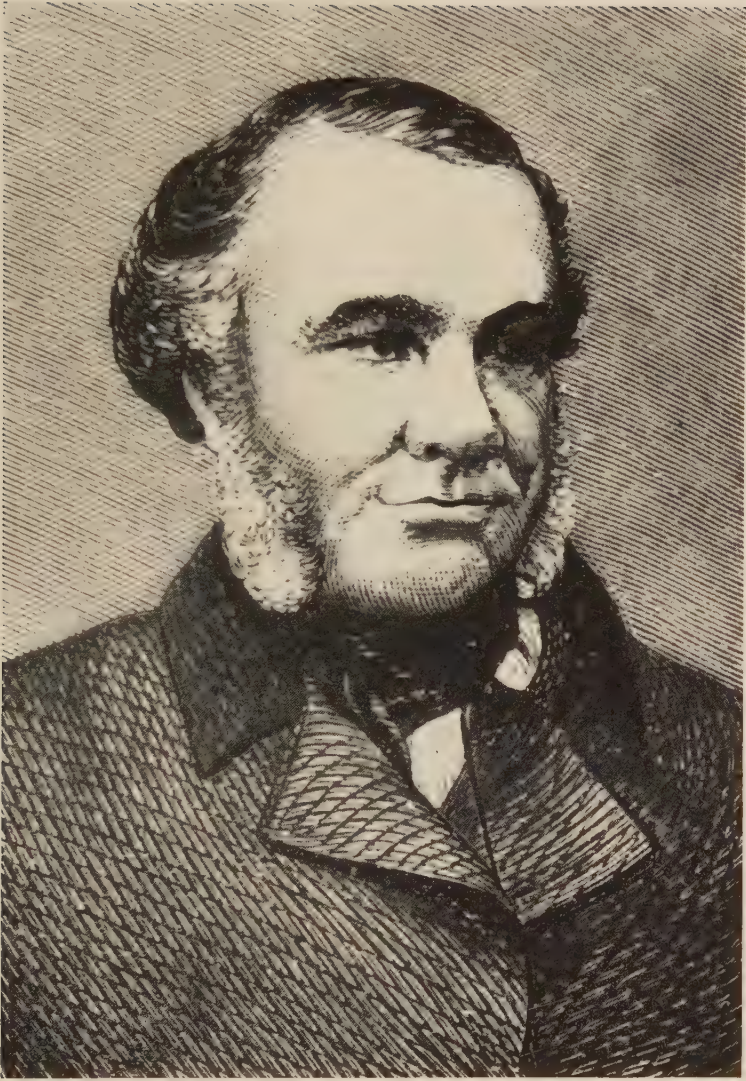


PLATE 24. THOMAS ADDISON (1793-1860)

in some way or other minister to the elaboration of the blood, I am not aware that any modern authority has ventured to assign to them any special function or influence whatever.

To the physiologist and to the scientific anatomist, therefore, they continue to be objects of deep interest; and doubtless both the physiologist and anatomist will be inclined to welcome and regard with indulgence the smallest contribution calculated to open out any new source of inquiry respecting them. But if the obscurity which at present so entirely conceals from us the uses of these organs justifies the feeblest attempt to add to our scanty stock of knowledge, it is not less true, on the other hand, that any one presuming to make such an attempt ought to take care that he do not, by hasty pretensions, or by partial and prejudiced observation, or by an overstatement of facts, incur the just rebuke of those possessing a sounder and more dispassionate judgment than himself.

Under the influence of these considerations I have for a considerable period withheld, and now venture to publish, the few facts bearing upon the subject that have fallen within my own knowledge, believing, as I now do, that these concurring facts, in relation to each other, are not merely casual coincidences, but are such as admit of a fair and logical inference—an inference that, where these concurring facts are observed, we may pronounce with considerable confidence the existence of diseased supra-renal capsules.

As a preface to my subject, it may not be altogether without interest or unprofitable to give a brief narrative of the circumstances and observations by which I have been led to my present convictions.

For a long period I had from time to time met with a very remarkable form of general anaemia, occurring without any discoverable cause whatever—cases in which there had been no previous loss of blood, no exhausting diarrhoea, no chlorosis, no purpura, no renal, splenic, miasmatic, glandular, strumous, or malignant disease.

Accordingly, in speaking of this form in clinical lecture, I perhaps with little propriety applied to it the term “idiopathic,” to distinguish it from cases in which there existed more or less evidence of some of the usual causes or concomitants of the anaemic state.

The disease presented in every instance the same general character, pursued a similar course, and, with scarcely a single exception, was followed, after a variable period, by the same fatal result.

It occurs in both sexes generally, but not exclusively, beyond the middle period of life, and, so far as I at present know, chiefly in persons of a somewhat large and bulky frame, and with a strongly-marked tendency to the formation of fat.

It makes its approach in so slow and insidious a manner that the patient can hardly fix a date to his earliest feeling of that languor which is shortly to become so extreme. The countenance gets pale, the whites of the eyes become pearly, the general frame flabby rather than wasted; the pulse, perhaps, large, but remarkably soft and compressible, and occasionally with a slight jerk, especially under the slightest excitement; there is an increasing indisposition to exertion, with an uncomfortable feeling of faintness or breathlessness on attempting it; the heart is readily made to palpitate; the whole surface of the body presents a blanched, smooth, and waxy appearance; the lips, gums, and tongue seem bloodless; the flabbiness of the solids increases; the appetite fails; extreme languor and faintness supervene, breathlessness and palpitations being produced by the most trifling exertion or emotion; some slight edema is probably perceived about the ankles; the debility becomes extreme. The patient can no longer rise from his bed, the mind occasionally wanders, he falls into a prostrate and half-torpid state, and at length expires. Nevertheless, to the very last, and after a sickness of, perhaps, several months' duration, the bulkiness of the general frame and the obesity often present a most striking contrast to the failure and exhaustion observable in every other respect.

With perhaps a single exception the disease, in my own experience, resisted all remedial efforts, and sooner or later terminated fatally.

On examining the bodies of such patients after death I have failed to discover any organic lesion that could properly or reasonably be assigned as an adequate cause of such serious consequences; nevertheless, from the disease having uniformly occurred in fat people, I was naturally led to entertain a suspicion that some form of fatty degeneration might have a share, at least, in its production; and I may observe that, in the case last examined, the heart had undergone such a change, and that a portion of the semilunar ganglion and solar plexus, on being subjected to microscopic examination, was pronounced by Mr. Quekett to have passed into a corresponding condition.

Whether any or all of these morbid changes are essentially con-

cerned—as I believe they are—in giving rise to this very remarkable disease, future observation will probably decide.

The cases having occurred prior to the publication of Dr. Bennett's interesting essay on "Leucocythaemia," it was not determined by microscopic examination whether there did or did not exist an excess of white corpuscles in the blood of such patients.

It was whilst seeking in vain to throw some additional light upon this form of anaemia that I stumbled upon the curious facts which it is my more immediate object to make known to the profession; and however unimportant or unsatisfactory they may at first sight appear, I cannot but indulge the hope that, by attracting the attention and enlisting the co-operation of the profession at large, they may lead to the subject being properly examined and sifted, and the inquiry so extended as to suggest, at least, some interesting physiological speculation, if not still more important practical indications.

The leading and characteristic features of the morbid state to which I would direct attention are, anaemia, general languor and debility, remarkable feebleness of the heart's action, irritability of the stomach, and a peculiar change of colour in the skin, occurring in connection with a diseased condition of the "supra-renal capsules."

As has been observed in other forms of anaemic disease, this singular disorder usually commences in such a manner that the individual has considerable difficulty in assigning the number of weeks, or even months, that have elapsed since he first experienced indications of failing health and strength; the rapidity, however, with which the morbid change takes place varies in different instances.

In some cases that rapidity is very great, a few weeks proving sufficient to break up the powers of the constitution, or even to destroy life, the result, I believe, being determined by the extent, and by the more or less speedy development of the organic lesion.

The patient, in most of the cases I have seen, has been observed gradually to fall off in general health; he becomes languid and weak, indisposed to either bodily or mental exertion; the appetite is impaired or entirely lost; the whites of the eyes become pearly; the pulse small and feeble, or perhaps somewhat large, but excessively soft and compressible; the body wastes, without, however, presenting the dry and shrivelled skin and extreme emaciation usually attendant

on protracted malignant disease; slight pain or uneasiness is from time to time referred to the region of the stomach, and there is occasionally actual vomiting, which in one instance was both urgent and distressing; and it is by no means uncommon for the patient to manifest indications of disturbed cerebral circulation.

Notwithstanding these unequivocal signs of feeble circulation, anaemia, and general prostration, neither the most diligent inquiry nor the most careful physical examination tend to throw the slightest gleam of light upon the precise nature of the patient's malady; nor do we succeed in fixing upon any special lesion as the cause of this gradual and extraordinary constitutional change.

We may, indeed, suspect some malignant or strumous disease—we may be led to inquire into the condition of the so-called blood-making organs—but we discover no proof of organic change anywhere—no enlargement of spleen, thyroid, thymus, or lymphatic glands—no evidence of renal disease, of purpura, of previous exhausting diarrhoea, or ague, or any long-continued exposure to miasmatic influences; but with a more or less manifestation of the symptoms already enumerated we discover a most remarkable and, so far as I know, characteristic discoloration taking place in the skin—sufficiently marked, indeed, as generally to have attracted the attention of the patient himself or of the patient's friends.

This discoloration pervades the whole surface of the body, but is commonly most strongly manifested on the face, neck, superior extremities, penis, and scrotum, and in the flexures of the axillae and around the navel.

It may be said to present a dingy or smoky appearance, or various tints or shades of deep amber or chesnut-brown; and in one instance the skin was so universally and so deeply darkened that but for the features the patient might have been mistaken for a mulatto.

In some cases the discoloration occurs in patches, or perhaps rather certain parts are so much darker than others as to impart to the surface a mottled or somewhat chequered appearance; and in one instance there were, in the midst of this dark mottling, certain insular portions of the integument presenting a blanched or morbidly white appearance, either in consequence of these portions having remained altogether unaffected by the disease, and thereby contrasting strongly with the surrounding skin, or, as I believe,

from an actual defect of colouring matter in these parts. Indeed, as will appear in the subsequent cases, this irregular distribution of pigment-cells is by no means limited to the integument, but is occasionally also made manifest on some of the internal structures.

We have seen it in the form of small black spots, beneath the peritoneum of the mesentery and omentum—a form which in one instance presented itself on the skin of the abdomen.

This singular discoloration usually increases with the advance of the disease; the anaemia, languor, failure of appetite, and feebleness of the heart, become aggravated; a darkish streak usually appears on the commissure of the lips: the body wastes, but without the emaciation and dry, harsh condition of the surface, so commonly observed in ordinary malignant diseases; the pulse becomes smaller and weaker; and without any special complaint of pain or uneasiness the patient at length gradually sinks and expires.

In one case, which may be said to have been acute in its development, as well as rapid in its course, and in which both capsules were found universally diseased after death, the mottled or chequered discoloration was very manifest, the anaemic condition strongly marked, and the sickness and vomiting urgent; but the pulse, instead of being small and feeble, as usual, was large, soft, and extremely compressible, and jerking on the slightest exertion or emotion, and the patient speedily died.

My experience, though necessarily limited, leads to the belief that the disease is by no means of very rare occurrence, and that were we better acquainted with its symptoms and progress, we should probably succeed in detecting many cases which in the present state of our knowledge, may be entirely overlooked or misunderstood; and, I think I may with some confidence affirm, that although partial disease of the capsules may give rise to symptoms, and to a condition of the general system extremely equivocal and inconclusive, yet that a more extensive lesion will be found to produce a state which may not only create a suspicion, but be announced with some confidence to arise from the lesion in question. When the lesion is acute and rapid, I believe the anaemic prostration and peculiar condition of the skin will present a corresponding character, and that whether acute or chronic, provided the lesion involve the entire structure of both organs, death will inevitably be the consequence.

If this statement be correct—and I quite believe it to be so—the chief difficulty that remains to be surmounted by further experience in this, I fear, irremediable disease, is a correct and certain diagnosis—how we may at the earliest possible period detect the existence of this form of anaemia, and how it is to be distinguished from other anaemic forms of disorder.

As I have already observed, the great distinctive mark of this form of anaemia is the singular dingy or dark discoloration of the skin; nevertheless, at a very early period of the disorder, and when the capsules are less extensively diseased, the discoloration may, doubtless, be so slight and equivocal as to render the source of the anaemic condition uncertain.

Our doubts, in such cases, will have reference to the sallow anaemic conditions resulting from miasmatic poisoning or malignant visceral disease; but a searching inquiry into the history of the case, and a careful examination of the several parts or organs usually involved in anaemic disease, will furnish a considerable amount of at least negative evidence; and when we fail to discover any of the other well-known sources of that condition, when the attendant symptoms resemble those enumerated as accompanying disease of the capsules, and when to all this is superadded a dark, dingy, or smoky-looking discoloration of the integument, we shall be justified at least in entertaining a strong suspicion in some instances, a suspicion almost amounting to certainty in others.

It must, however, be observed, that every tinge of yellow, or mere sallowness, throws a still greater doubt over the true nature of the case, and that the more decidedly the discoloration partakes of the character described, the stronger ought to be our impression as to the capsular origin of the disorder. The morbid appearances discovered after death will be described with the cases in which they occurred; but I may remark that a recent direction (March, 1855) has shown that even malignant disease may exist in both capsules, without giving rise to any marked discoloration of the skin; but, in the case alluded to, the deposit in each capsule was exceedingly minute, and could not have seriously interfered with the functions of the organs; extensive and fatal malignant disease had, however, affected other parts.

It may be observed in conclusion, that on subjecting the blood of a patient who recently died from a well-marked attack of this

singular disease to microscopic examination, a considerable excess of white corpuscles was found to be present.

CASE I.—REPORTED BY MR. THOMAS FULLER

James Wootten, aet. 32, admitted into Guy's Hospital, under Dr. Golding Bird, Feb. 6, 1850, has been residing in Long Alley, Moorfields, and is by occupation a baker.

States that he was attacked with cough three years since, which he was unable to get rid of by ordinary remedies, and was finally cured at St. Bartholomew's, after taking pills for one week.

From this time his skin, previously white, began to assume a darker hue, which has been gradually increasing. Twelve months after leaving the above hospital he was laid up from excessive weakness, the result of his cough, which had again appeared, and incapacitated him for his work. He now became an out-patient of St. Thomas's, under Dr. Goolden, who cured his cough, and thinking that the colour of his skin depended on jaundice, treated him for that disease, but to no purpose.

He left the hospital in tolerable health, but subsequently lost flesh, and became so excessively weak, the colour of his skin at the same time getting rapidly darker, that he applied for admission here, which was granted him.

Present appearances.—The whole of the skin of the body is now of a dark hue, and he has just the appearance of having descended from coloured parents, which he assured me is not the case, nor have any of his family for generations, that he can answer for, manifested this peculiarity.

The colour of the skin does not at all resemble that produced by the absorption of the nitrate of silver, but has more the appearance of the pigment of the choroid of the eye; it seems to have affected some parts of the body more than others, the scrotum and penis being the darkest, the soles of the feet and palms of the hands the lightest; the cheeks are a little sunken; the nose is pointed; the conjunctiva are of a pearly whiteness; the voice is puny and puerile, the patient speaking with a kind of indescribable whine, and his whole demeanour is childish.

He complains of a sense of soreness in the chest about the scrobiculus cordis.

The chest is well-formed and perfectly resonant; the sounds of

the heart are also healthy; there is some slight fulness in the region of the stomach.

The urine is of a proper colour, and he has passed in twelve hours one and a half pints, which has a specific gravity 1008, an acid reaction, and contains neither albumen nor sugar; there is also some pain on pressure in the left lumbar region.

Feb. 8—Dr. Bird wished a likeness to be taken, so as to be able to watch any alterations in his colour; and considering the case one of anaemia, ordered *Lyn. Ferri Iodidi 3j, ter die*; and middle diet.

These he took the whole of the time he was in the hospital, and was discharged in April, rather stronger, but the colour remaining precisely the same.

Shortly after his discharge from the hospital he was seized with acute pericarditis and pulmonic inflammation, under which he speedily sank and died.

The following is a report of the post-mortem examination:—Lungs universally adherent, the adhesions being very old. The upper lobe of the right lung contained some small defined patches of recent pneumonia, about the size of a crown piece, surrounded by tolerably healthy structure.

The lower lobe was extremely fleshy and without air. The left lung was bound down by old pleuritic adhesions, which were very tough and difficult to be torn through. The substance of this lung was fleshy, and contained but little air.

There was no tubercle or cavity.

The mucous membrane of the bronchial tubes were considerably injected, and, I believe, rather thickened.

The pericardium was distended with a fluid of a deep brown colour, amounting to about half a pint; recent lymph was effused over the whole serous surface.

The liver and spleen were both of weak texture, and easily broken down; the structure of the liver rather coarse.

The gall-ducts pervious.

The gall bladder contained the usual quantity of bile, which was thin, watery, and clear.

The thoracic duct was pervious throughout; and there was no obstruction to any of the veins or arteries that I could discover.

The colour of the blood in the arteries had an unusually dark appearance.

The kidneys were quite healthy and of full size.

The supra-renal capsules were diseased on both sides, the left about the size of a hen's egg, with the head of the pancreas firmly tied down to it by adhesions. Both capsules were as hard as stones. Intestines pale. Lumbar glands natural. No tubercular deposit was discovered in any organ. The head was not examined.

In some of the cases about to be given the capsules merely participated in disease affecting other organs, either of a strumous or malignant character, and it might consequently be doubtful whether the peculiar symptoms depended upon such complications, or upon the special disease of the capsules. In the above instance, however, no such doubt could reasonably be entertained, inasmuch as there was found no abnormal condition whatever of any other organ to which the peculiar symptoms could by any means be attributed. The slow and gradual inroads of the disease, and the remarkable excess of pigment, were sufficiently accounted for by the universality of the change that had taken place in the structure of both capsules; at least, such would be the legitimate conclusion to be drawn from a comparison of the present with other cases about to be related.

RUDOLF VIRCHOW

(1821-1902)

*MODERN PATHOLOGY properly begins with the classic work published in 1858 by Rudolf Virchow of Berlin entitled "Die Cellularpathologie in ihrer Begründung auf physiologische und pathologische Gewebelehre." As we have seen, biological thinking in a cellular sense commenced about 1840, and part of the new concept was promptly introduced into pathology by Rokitansky, who followed the wrong direction, however, in its application. The first half of the decade even saw the publication of two atlases of pathological histology, by Julius Vogel and Hermann Lebert respectively, in which effort was made, and with some success, to picture the manner in which cells heaped up or were variously changed as a result of disease. These isolated efforts were completely overshadowed, however, by the "Cellularpathologie." This appeared as a compilation of lectures as the author was commencing his tenure as professor of pathology in Berlin, but was based in large measure on observations made while in a humbler position, and on analytic studies and syntheses of principles made when Virchow was professor in the smaller University of Würzburg. One of the most important of the investigations leading up to this great work was an elaborate research on thrombosis and embolism, which solved the age-long riddle of pyemia. This was completed before the author was twenty-six years of age. The results of this study were published in two articles. The first of these, which appeared in *Frorieps N. Notizen* in January 1846, is reproduced here. The second selection reprinted here is from the "Cellularpathologie" and contains the essence of the doctrine Virchow gave to the world with his immortal aphorism "omnis cellula e cellula."*

ON OCCLUSION OF THE PULMONARY ARTERIES

(From *Froriep's Notizen*, January 1846)¹

Only in recent times has attention been drawn with frequency to the equally remarkable and important phenomenon of occlusion of the pulmonary arteries by clotted blood. The views on its origin and significance, however, in the few cases recorded up to the pres-

¹ Translation by the editor.



PLATE 25. RUDOLF VIRCHOW (1821-1902)
AS A YOUNG PROFESSOR.

ent time, are not in the slightest agreement. Yet the paucity of such observations, is due simply to lack of investigation, for after paying special attention to the subject for more than a year at the necropsies in the Berlin Charité, I can give assurance that occlusion of the pulmonary arteries must be included at least among the commoner lesions of disease. The following reports, the details and further development of which I reserve for another place, relate principally to a hitherto unconsidered origin of this occlusion, of which I have already spoken in a public address on the occasion of the celebration of the Friedrich-Wilhelm Medical and Surgical Institute, August 2nd of last year.

The views so far proposed for the cause of this obstruction in the pulmonary arteries, can be brought together into four groups: (1) Blood clotting occurs as a result of compression of a branch of the pulmonary artery at some point, as when an artery is ligated; (2) a harmful substance or an irritation transmitted from adjoining structures by continuity of parts, sets up an inflammation in such a vessel, and this brings about clotting of the column of blood in the vessel, as is assumed for other blood-vessels; (3) the blood clots spontaneously, without a mechanical obstacle and without the agency of the vessel walls; the agency for clotting lies in the blood itself or in some elements mixed with it; (4) the occlusion results from a more or less compact mass which is brought by the circulation to the pulmonary arteries and there impacted. All of these circumstances are possible, and it will always remain very difficult in many cases to prove one or the other. Above all it appears necessary to me to distinguish a primary and a secondary clotting in the pulmonary arteries in reference to the relation between the condition of the vessel wall and that of the lung parenchyma; i.e., the obstruction of the artery may be the result of parenchymal change or independent thereof, or at other times the obstruction may bring about the alteration of the parenchyma.

The obliteration of individual branches of the pulmonary artery in tuberculosis, which has been so convincingly demonstrated by the injections of Schröder van der Kolk and Guillot, and the corresponding occlusion commonly observed in extensive pneumonia, etc., speak against a secondary coagulation due to slowing of the blood stream from mechanical hindrance. To assume that here an inflammatory process in the lung parenchyma is propagated on the walls of the blood vessels, and terminates with obliteration

of the vessel lumen, is purely arbitrary, as long as inflammation of the vessel wall is not actually demonstrated. Paget includes as instances of secondary coagulation those cases where an occlusion of the arterial lumen occurs coincidentally with pulmonary edema and pulmonary apoplexy; *a priori* there is no reason why pulmonary edema of itself without further proof can be considered a cause of clotting of arterial blood, and the mere simultaneous occurrence of the two conditions can with the same justification be considered an incident of correlation, as one of cause and effect. In fact in pulmonary apoplexy Bochdalek has reversed the relationship, deriving the hemoptoic pulmonary infarct of Laennec from inflammation of a portion of the pulmonary artery, which also contains "lymph plugs." This inflammation in Bochdalek's view originates in the finer and smaller branches and twigs, indeed in all probability in the capillaries, and propagates in a retrograde direction; even should one find in the finer vascular ramifications no lymph plugs, still this would be no proof for the absence of inflammation. This kind of deduction is highly dogmatic, and it would have been at least desirable if Bochdalek had made public in how many of his fifty-nine cases of hemoptoic infarct inflammation was not recognizable. If a hemorrhage occurs in any part of the lung and the extravasated blood coagulates, one can easily show that a vessel is occluded thereby and the blood within it clots. Why, however, an inflammation of the capillaries always propagates backward and not forward, and how it brings about an extravasation of blood, which is there in every case, is all the less understandable since the occurrence of "lymph-plugs" in the arteries as a simple process of inflammation (*premier effet de l'inflammation*—Cruveilhier) is in no way a demonstrated fact. I have certainly seen the hemoptoic pulmonary infarct associated with obliteration of branches of the pulmonary artery, where it was obvious that the obliteration was not caused by the exudate.

In the same category belongs that clotting of the pulmonary artery occurring in lobular (metastatic) abscesses, which have been looked upon since Dance's time as the result of a capillary phlebitis, brought about by the irritation of pus in the circulating blood. The mechanical theories have certainly not met with fortune here. It is fairly clear that it is not a case of occlusion of the pulmonary capillaries by the pus corpuscles because of their size, since it has been demonstrated that the white blood corpuscles (lymph corpuscles)

are no different from pus corpuscles. Hasse tried to escape difficulty by assuming that the pus accumulates in the blood stream and surrounds itself by repeated new layers of coagulum until the lumen of certain vessels is occluded, but he overlooked the fact that this explanation is not adapted for those cases where the abscesses skip certain organs lying in the path of the pus. All this, however, proves nothing for the inflammatory theory, but much rather demands new investigation.

As one of these processes Paget and Bouchut distinguish primary, spontaneous clotting of the blood in the pulmonary artery. The latter leaves the circumstances unexplained, while Paget seeks its causes in an abnormal state of the blood characterized by an increased tendency to adhesion between blood and vessel wall. Among other conditions the presence of urea in the blood might bring about such a situation.

Against these quite hypothetical assumptions I believe the following conclusion can be derived from the facts:

The primary occurrence of old, long antemortem clots (fibrin plugs) in the pulmonary artery, where obviously the obstruction of the artery precedes the surrounding changes in the parenchyma, or is independent thereof, is, in relation to the original site of the clotting, always secondary. These plugs arise from any part of the vascular system preceding the lung in the circulation, that is, in the veins or the right heart, and are brought to the pulmonary artery through the blood stream. I consider the following facts proof of this statement:

As often as I have found plugs in the pulmonary artery I have always been able to demonstrate plugs also in the venous system leading thereto (the portal system of course does not, while the right heart does, belong to this system) and I consider the occurrence of the former a sure sign that old blood clots are to be found in some part of the venous system. However it is more frequently the so-called spontaneous clots than those due to phlebitis, which are found coincidently with the obstruction of the pulmonary artery. The less the attention devoted to this previously, the less naturally the possibility of noting this relationship. In 76 necropsies which I performed last August in the dead house of the Berlin Charité, venous plugs occurred 18 times, and in 11 cases there were likewise plugs in the pulmonary artery; that is, for 10 venous plugs there were 6 in the lungs. These were distributed as follows:

Vena cava inferior	I	Arteria pulmonalis	0
“ iliaca	I	“ “	1
“ hypogastr.	I	“ “	0
“ cruralis	5	“ “	4
“ prof. femor.	3	“ “	3
“ tibialis post.	I	“ “	0
Sinus long. sup.	3	“ “	2
“ transversus	3	“ “	I

Only once was it impossible to recognize a corresponding venous clot. This was in a case where the right kidney lay in the upper pelvic aperture as a result of congenital dislocation, and was rather moveable. Rayer (*Traité des mal. des reins* III. p. 791) cites a case from Girard where edema of the lower extremities occurred in a case of mobile kidney, and at necropsy the inferior vena cava showed a definite division above which was a widening, and below, a kind of areolar or cavernous tissue (old plug formation) extending to within two or three inches of the inguinal fold. It seems to me that a natural connection between these two cases can be drawn.

2. The plugs in the pulmonary artery, when young, fill the entire diameter of the branch involved, without adhering to the walls, and without alteration of the texture of the latter. When they are old they stick to one wall of the vessel, which shows no other change than that due to shrinkage of the obturating plug and to the thrombus formation.

3. In the majority of cases the plugs do not originate in the capillaries, but extend a certain distance into the pulmonary artery, usually being seated at the dividing point of a larger vessel or riding the bifurcation. Their size depends entirely on the point of their impaction, which can occur in the main trunk as well as in a peripheral branch. The usual site, as Paget has already noted, is in vessels of the second or third order. In front of and behind them nothing more than fresh clotting of blood is to be seen; later other changes develop.

4. The age and degree of metamorphosis of these plugs corresponds in general with the condition of the venous plugs. It is to be noted, however, that both in the pulmonary artery and in the veins new clots can be added to the earlier ones.

5. When the blood within a vein clots, the coagulation extends

as a rule not simply to the next vessel maintaining circulation, but across its mouth and a greater or less distance into its lumen. This extremely important law, as far as I know, has received neither consideration nor recognition. The explanation is the fact that in the absence of contractility of the veins, the remaining circulating blood cannot at the same time fill out the lumen of the vessel and maintain its previous speed; accordingly, for a certain distance a layer of slowly moving, possibly even stagnating blood occurs. This situation is found particularly when the coagulation occurs in a large vessel, which perhaps in addition discharges close to and above a valve, or when one of two equal sized vessels making up a larger trunk is obliterated. If, for example, the right iliac vein is occluded, a fibrin plug in continuity with the mass filling the iliac, lies along the right wall of the inferior vena cava and extends as a rule up to the renal vein; the blood from the left iliac vein flows past this. In consequence of its greater wetness this part has always a marked tendency to softening; after a certain time, accordingly, the blood streaming against it will be able to loosen it and free portions from it. Now it is easy to establish, on the basis of observation on the cadaver as well as numerous experiments, that the free ends of blood clots directed toward the open vessel are comparatively round or oval and more or less cone-shaped, but always smooth at the termination. In the situation here defined, however, these ends are found irregular, rough, stair-like, and shortened, in comparison with fresher clots at these places. Might it not be assumed that here the same sort of washing out and gnawing off has occurred as is seen every day on the banks of a stream? However, I have had the good fortune to observe cases where the capping pieces torn from the ends of clots, although removed to a greater or less distance, were still to be found, and it was easy to prove from their upper concave, lower convex and reverse stair-like surface that they had been separated from a particular place. Such cases are certainly very rare, since it is not always that such a cap is torn loose in its entirety, and only at times are they still to be found in the pulmonary artery. Here the relations become more complicated, and I believe I have done enough in the way of a preliminary statement to bring the matter to a simple mechanical point of view. Of the possible objections and of the detail of appearance, as well as the effect of this obstruction on the lung and the whole body, I shall speak later.

THE CELL THEORY²

The present reform in medicine, of which you have all been witnesses, essentially had its rise in new anatomical observations, and the exposition also, which I have to make to you, will therefore principally be based upon anatomical demonstrations. But for me it would not be sufficient to take, as has been the custom during the last ten years, pathological anatomy alone as the groundwork of my views; we must add thereto those facts of general anatomy also, to which the actual state of medical science is due. The history of medicine teaches us, if we will only take a somewhat comprehensive survey of it, that at all times permanent advances have been marked by anatomical innovations, and that every more important epoch has been directly ushered in by a series of important discoveries concerning the structure of the body. So it was in those old times, when the observations of the Alexandrian school, based for the first time upon the anatomy of man, prepared the way for the system of Galen; so it was, too, in the Middle Ages, when Vesalius laid the foundations of anatomy, and therewith began the real reformation of medicine; so, lastly, was it at the commencement of this century, when Bichat developed the principles of general anatomy. What Schwann, however, has done for histology, has as yet been but in a very slight degree built up and developed for pathology, and it may be said that nothing has penetrated less deeply into the minds of all than the cell-theory in its intimate connection with pathology.

If we consider the extraordinary influence which Bichat in his time exercised upon the state of medical opinion, it is indeed astonishing that such a relatively long period should have elapsed since Schwann made his great discoveries, without the real importance of the new facts having been duly appreciated. This has certainly been essentially due to the great incompleteness of our knowledge with regard to the intimate structure of our tissues which has continued to exist until quite recently, and, as we are sorry to be obliged to confess, still even now prevails with regard to many points of histology to such a degree, that we scarcely know in favour of what view to decide.

Especial difficulty has been found in answering the question,

² From the translation of the *Cellularpathologie* by Frank Chance, Philadelphia, 1863.

from what parts of the body action really proceeds—what parts are active, what passive; and yet it is already quite possible to come to a definitive conclusion upon this point, even in the case of parts the structure of which is still disputed. The chief point in this application of histology to pathology is to obtain a recognition of the fact, that the cell is really the ultimate morphological element in which there is any manifestation of life, and that we must not transfer the seat of real action to any point beyond the cell. Before you, I shall have no particular reason to justify myself, if in this respect I make quite a special reservation in favour of life. In the course of these lectures you will be able to convince yourselves that it is almost impossible for any one to entertain more mechanical ideas in particular instances than I am wont to do, when called upon to interpret the individual processes of life. But I think that we must look upon this as certain, that, however much of the more delicate interchange of matter, which takes place within a cell, may not concern the material structure as a whole, yet the real action does proceed from the structure as such, and that the living element only maintains its activity as long as it really presents itself to us as an independent whole.

In this question it is of primary importance (and you will excuse my dwelling a little upon this point, as it is one which is still a matter of dispute) that we should determine what is really to be understood by the term cell. Quite at the beginning of the latest phase of histological development, great difficulties sprang up in crowds with regard to this matter. Schwann, as you no doubt recollect, following immediately in the footsteps of Schleiden, interpreted his observations according to botanical standards, so that all the doctrines of vegetable physiology were invoked, in a greater or less degree, to decide questions relating to the physiology of animal bodies. Vegetable cells, however, in the light in which they were at that time universally, and as they are even now also frequently regarded, are structures, whose identity with what we call animal cells cannot be admitted without reserve.

* * *

It is only when we adhere to this view of the matter, when we separate from the cell all that has been added to it by an after-development, that we obtain a simple, homogeneous, extremely monotonous structure, recurring with extraordinary constancy in

living organisms. But just this very constancy forms the best criterion of our having before us in this structure one of those really elementary bodies, to be built up of which is eminently characteristic of every living thing—without the pre-existence of which no living forms arise, and to which continuance and the maintenance of life is intimately attached. Only since our idea of a cell has assumed this severe form—and I am somewhat proud of having always, in spite of the reproach of pedantry, firmly adhered to it—only since that time can it be said that a simple form has been obtained which we can everywhere again expect to find, and which, though different in size and external shape, is yet always identical in its essential constituents.

In such a simple cell we can distinguish dissimilar constituents, and it is important that we should accurately define their nature also.

In the first place, we expect to find a *nucleus* within the cell; and with regard to this nucleus, which has usually a round or oval form, we know that, particularly in the case of young cells, it offers greater resistance to the action of chemical agents than do the external parts of the cell, and that, in spite of the greatest variations in the external form of the cell, it generally maintains its form. The nucleus is accordingly, in cells of all shapes, that part which is the most constantly found unchanged. There are indeed isolated cases, which lie scattered throughout the whole series of facts in comparative anatomy and pathology, in which the nucleus also has a stellate or angular appearance; but these are extremely rare exceptions, and dependent upon peculiar changes which the element has undergone. Generally, it may be said that, as long as the life of the cell has not been brought to a close, as long as cells behave as elements still endowed with vital power, the nucleus maintains a very nearly constant form.

The nucleus, in its turn, in completely developed cells, very constantly encloses another structure within itself—the so-called *nucleolus*. With regard to the question of vital form, it cannot be said of the nucleolus that it appears to be an absolute requisite; and, in a considerable number of young cells, it has as yet escaped detection. On the other hand, we regularly meet with it in fully developed, older forms; and it, therefore, seems to mark a higher degree of development in the cell. According to the view which was put forward in the first instance by Schleiden, and accepted by Schwann, the connection between the three coexistent cell-constit-

uents was long thought to be on this wise: that the nucleolus was the first to shew itself in the development of tissues, by separating out of a formative fluid (blastema, cyto-blastema), that it quickly attained a certain size, that then fine granules were precipitated out of the blastema and settled around it, and that about these there condensed a membrane. That in this way a nucleus was completed, about which new matter gradually gathered, and in due time produced a little membrane (the celebrated watch-glass form). This description of the first development of cells out of free blastema, according to which the nucleus was regarded as preceding the formation of the cell, and playing the part of a real cell-former (*cytoblast*), is the one which is usually concisely designated by the name of the *cell-theory* (more accurately, theory of *free* cell-formation),—a theory of development which has now been almost entirely abandoned, and in support of the correctness of which not one single fact can with certainty be adduced. With respect to the nucleolus, all that we can for the present regard as certain, is, that where we have to deal with large and fully developed cells, we almost constantly see a nucleolus in them; but that, on the contrary, in the case of many young cells it is wanting.

* * *

In my first lecture, gentlemen, I laid before you the general points to be noted with regard to the nature and origin of cells and their constituents. Allow me now to preface our further considerations with a review of the animal tissues in general, and this both in their physiological and pathological relations.

The most important obstacles which, until quite recently, existed in this quarter, were by no means chiefly of a pathological nature. I am convinced that pathological conditions would have been mastered with far less difficulty if it had not, until quite lately, been utterly impossible to give a simple and comprehensive sketch of the physiological tissues. The old views, which have in part come down to us from the last century, have exercised such a preponderating influence upon that part of histology which is, in a pathological point of view, the most important, that not even yet has unanimity been arrived at, and you will therefore be constrained, after you have inspected the preparations I shall lay before you, to come to your own conclusions as to how far that which I have to communicate to you is founded upon real observation.

If you read the “*Elementa Physiologiae*” of Haller, you will find, where the elements of the body are treated of, the most prominent position in the whole work assigned to *fibres*, the very characteristic expression being there made use of, that the fibre (*fibra*) is to the physiologist what the line is to the geometrician.

This conception was soon still further expanded, and the doctrine that fibres serve as the groundwork of nearly all the parts of the body, and that the most various tissues are reducible to fibres as their ultimate constituents, was longest maintained in the case of the very tissue in which, as it has turned out, the pathological difficulties were the greatest—in the so-called cellular tissue.

In the course of the last ten years of the last century there arose, however, a certain degree of reaction against this fibre-theory, and in the school of natural philosophers another element soon attained to honour, though it had its origin in far more speculative views than the former, namely, the *globule*. Whilst some still clung to their fibres, others, as in more recent times Milne Edwards, thought fit to go so far as to suppose the fibres, in their turn, to be made up of globules ranged in lines. This view was in part attributable to optical illusions in microscopical observation. The objectionable method which prevailed during the whole of the last and a part of the present century—of making observations (with but indifferent instruments) in the full glare of the sun—caused a certain amount of dispersion of light in nearly all microscopical objects, and the impression communicated to the observer was, that he saw nothing else than globules. On the other hand, however, this view corresponded with the ideas common amongst natural philosophers as to the primary origin of everything endowed with form.

These globules (granules, molecules) have, curiously enough, maintained their ground, even in modern histology, and there are but few histological works which do not begin with the consideration of elementary granules. In a few instances, these views as to the globular nature of elementary parts have, even not very long ago, acquired such ascendancy, that the composition, both of the primary tissues in the embryo and also of the later ones, was based upon them. A cell was considered to be produced by the globules arranging themselves in a spherical form, so as to constitute a membrane, within which other globules remained, and formed the contents. In this way did even Baumgärtner and Arnold contend against the cell theory.

This view has, in a certain manner, found support even in the history of development—in the so-called *investment-theory* (Umhüllungstheorie)—a doctrine which for a time occupied a very prominent position. The upholders of this theory imagined, that originally a number of elementary globules existed scattered through a fluid, but that, under certain circumstances, they gathered together, not in the form of vesicular membranes, but so as to constitute a compact heap, a globe (mass, cluster—Klumpchen), and that this globe was the starting point of all further development, a membrane being formed outside and a nucleus inside, by the differentiation of the mass, by apposition, or intussusception.

At the present time, neither fibres, nor globules, nor elementary granules, can be looked upon as histological starting-points. As long as living elements were conceived to be produced out of parts previously destitute of shape, such as formative fluids, or matters (*plastic matter, blastema, cytoblastema*), any one of the above views could of course be entertained, but it is in this very particular that the revolution which the last few years have brought with them has been the most marked. Even in pathology we can now go so far as to establish as a general principle, *that no development of any kind begins de novo, and consequently as to reject the theory of equivocal (spontaneous) generation just as much in the history of the development of individual parts as we do in that of entire organisms*. Just as little as we can now admit that a taenia can arise out of saburral mucus, or that out of the residue of the decomposition of animal or vegetable matter an infusorial animalcule, a fungus, or an alga, can be formed, equally little are we disposed to concede either in physiological or pathological histology, that a new cell can build itself up out of any non-cellular substance. Where a cell arises, there a cell must have previously existed (*omnis cellula e cellula*), just as an animal can spring only from an animal, a plant only from a plant. In this manner, although there are still a few spots in the body where absolute demonstration has not yet been afforded, the principle is nevertheless established, that in the whole series of living things, whether they be entire plants or animal organisms, or essential constituents of the same, an eternal law of *continuous development* prevails. There is no discontinuity of development of such a kind that a new generation can of itself give rise to a new series of developmental forms. No developed tissues can be traced back either to any large or small simple element, unless it be unto a cell.

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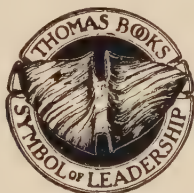
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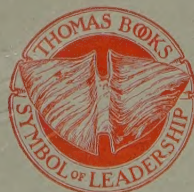
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